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USSR AND EASTERN EUROPE SCIENTIFIC ABSTRACTS

ENGINEERING AND EQUIPMENT

No. 47

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	CONTENTS	PAGE
ENGINEERING		
Acoustical and Ultrasonic		1
Atomic and Nuclear		4
Construction		8
Heat, Combustion, Detonation		14
Hydraulic & Pneumatic		22
Industrial, Power		26
Materials		35
Metrology		42
Mining, Petroleum, Geological		50
Precision Mechanical & Optical		52
Stress Analysis & Stability Studies		58
Turbine & Engine Design		63
EQUIPMENT		
Acoustical & Ultrasonic		69
Aeronautical & Space		74
Gyroscopic		79
Hydraulic & Pneumatic		84

TABLE OF CONTENTS
(Continued)

	PAGE
EQUIPMENT	
Industrial & Mining	86
Measuring, Testing	92
Optical	103
Refrigeration	105
Transportation	107
Vacuum & Cryogenic	108

ENGINEERING

Acoustical and Ultrasonic

USSR

UDC 691.327:539.3

RELATIONSHIP BETWEEN STRESS-STRAIN STATE OF CONCRETE AND ACOUSTICAL EMISSIONS

Moscow BETON I ZHELEZOBETON in Russian, No 4, Apr 78, pp 41-42

KALASHNIKOV, V. A., YEREMENKO, V. P.

[Abstract] The statistical theory of strength is applied to quantitative description of processes of deformation and failure of heterogeneous composite materials such as concrete and the acoustical emission which arises upon formation of cracks in such structures. This strength theory considers that microscopic failures of elementary volumes of the material which accumulate upon loading are responsible for eventual general failure of the structures. It is shown that the acoustical emission which arises upon compression of concrete characterizes this accumulation of damaged unit cells in the structure and at the same time is a characteristic of the nonlinear deformation of the structures. It is suggested that acoustical emission be used to estimate the stresses applied to concrete structures and predict the eventual strength and failure of the structures. Figure 1; references 5 (Russian).

USSR

UDC 620.179.16

USE OF ACOUSTIC HEAD WAVES FOR ULTRASONIC INSPECTION

Sverlovsk, DEFECTOSKOPIYA No 1, 1978 pp 33-40 manuscript received Dec 76

YERMOLOV, I. N., RAZYGRAYEV, N. P., SHCHERBINSKIY, V. G.

[Abstract] In studying some of the properties of head waves and the possibilities of making practical use of the incidence of a wave from a point source at the interface of two media was considered. The longitudinal elastic head waves are excited and received by inclined selectors with an angle equal to the first critical angle. The waves are not dissipated on the uneven surfaces but reveal defects in the layer under the rough surface of objects such as tracks under a buildup surface. They can also be used to measure the velocity of longitudinal waves in materials. The described experiments showed that the optimal sensitivity to discovering defects by headwaves is reached at a depth of 4 to 10 mm from the surface.

USSR

UDC 621.315.611.001.4

ANALYSIS OF BREAKDOWN PROCESSES IN ELECTRICAL INSULATION MATERIALS BY
MEASUREMENT OF ACOUSTIC EMISSION

Moscow ELEKTROTEKHNIKA in Russian No 5, May 78 pp 43-46

ARONSHTAM, YU. L., candidate in technical sciences, BIBER, L. A., candidate in technical sciences, BRAUDE, L. I., engineer, KARPOVA, G. I., engineer, KOZHICHKIN, V. KH., engineer, PODOL'SKAYA, G. V., engineer, FREYYEROV, V. O., engineer

[Abstract] A study was made to establish the feasibility of inspecting electrical insulation materials for fatigue breakdown by the acoustic emission method. Cyclic bending tests were performed on dummy conductors with impregnated thermosetting tape insulation, to simulate stator windings of a generator, and on specimens of glass Textolite. As a result, a relation has been established between acoustic emission signals and conventional criteria such as the insulation breakdown voltage or the natural frequency and the temperature rise due to vibrations. On the basis of acoustic emission parameters, a dangerous condition can be detected before the electric strength of a thermosetting insulation has appreciably decreased. The exponential amplitude distribution of acoustic emission pulses during breakdown of glass Textolite could serve as a means of detecting fatigue in this material. Figures 7; tables 1; references 4: 3 Russian, 1 Western.

USSR

UDC 534-13:534-143

RESONANCE EXCITATION OF ULTRASONIC VIBRATIONS IN MAGNETIC LIQUIDS

Minsk DOKLADY AN BSSR in Russian Vol 22 No 3, Mar 78 pp 242-243 manuscript submitted 9 Dec 77

BAYEV, A. R., and PROKHORENKO, P. P., Physicotechnical Institute, Academy of Sciences Belorussian SSR

[Abstract] This article describes the first experiment by the authors in the generation of ultrasonic vibrations in magnetic liquids using a resonant, variable, nonuniform magnetic field. The amplitudes of the sound pressure are described as functions of the magnetic field frequency, and the resonance frequency of the ultrasonic vibrations as a function of the resonator configuration. The data gathered on these functions are plotted in the form of graphs.

Well-expressed resonance excitation of the ultrasonic vibrations occurred in the cylindrical resonators with one free boundary and rigid remaining boundaries filled with ferromagnetic liquid. The system had a Q-factor of 200 to 400. The experimental data agree with the classical concept of a cylindrical resonator subjected to a force continuously distributed over its volume. The magnetization relaxation time of the liquid used in the experiment was comparatively low.

USSR

UDC 669-151

ULTRASONIC HEATING OF ELECTRICALLY CONDUCTING OBJECTS

Kiev PROBLEMY MASHINOSTROYENIYA (Collection of Articles) in Russian No 4, 1977 pp 6-10 manuscript received 4 Dec 75

BURAK, YA. I., GALAPATS, B. P., and GNIDETS, B. M., L'vov Division of Mathematical Physics, Institute of Mathematics, Academy of Sciences Ukrainian SSR

[Abstract] Ultrasonic heating is widely used for heat treatment of metals and alloys. Here such heating of an electrically conducting layer between two thermally insulating media is analyzed on the basis of the Maxwell electric field equations and the general equation of heat conduction. The model of such a conducting layer takes into account the thermodynamic dependence of the electrode potential on both the strain and the temperature, but disregards the effect of ponderomotive forces as well as thermoelectric effects and the temperature dependence of the elastic strain. The equations are solved for a layer whose surface vibrates with a steady amplitude and at a steady frequency, while the substrate remains stationary. The results of calculations indicate that, depending on the frequency of external action, either maximum local heating at the surface can be achieved near the first resonant frequency or almost uniform heating throughout the layer can be achieved near the second resonant frequency. In any case the frequency must be sufficiently far from resonance to limit the mechanical stresses. Figures 3; references 3 (Russian).

USSR

UDC 621.039.566

SOME RESULTS OF PUTTING NUCLEAR POWERPLANTS WITH THE VVER-440 REACTOR ON STREAM

Moscow ATOMNAYA ENERGIYA in Russian No 4, Apr 78 pp 299-305 manuscript received 28 Feb 77

VOZNESENSKII, V. A.

[Abstract] A number of water-cooled, water-moderated 440-MW reactors have been put in operation in the USSR and CMEA member countries. General information is presented on the VVER-440 power reactor. The flow through the reactor is 43,500-48,000 m³/hr, with a pressure drop of 4.1-4.8 kg/cm² in the primary loop, 2.2-3.4 kg/cm² in the reactor, 1.4-2.6 kg/cm² in the core, or 0.8-0.9 per fuel packet. The basic requirements placed on cores for the reactor are: operating time between recharging cycles 6000-7000 hr ef; fuel assemblies remain 3-4 years in the reactor; negative or near 0 temperature coefficient of reactivity, and negative overall power coefficient of reactivity; unevenness of power production among fuel assemblies in the core not over 1.35:1, among fuel elements in an assembly, not over 1.5:1; effectiveness of control system assemblies sufficient to compensate for rapid reactivity effects. During normal operation, emission of radioactivity into the atmosphere is 5-100 C/day (radioactive gases); 10⁻²-10⁻⁴ C/day (aerosols); 10⁻³-10⁻⁴ C/day (I¹³¹); 10⁻⁴-10⁻⁶ C/day (Sr⁸⁹+Sr⁹⁰), all well below the required standards. The main stages in startup and adjustment operations of the reactor are listed and very briefly described. Table 1; references 4: 3 Russian, 1 Western.

USSR

UDC 536.248.2

GENERALIZATION OF EXPERIMENTAL DATA ON HEAT TRANSFER DURING BOILING OF DISSOCIATIVE N₂O₄ IN A VERTICAL TUBE

Minsk IZVESTIYA AKADEMII NAUK BELORUSSKOY SSR, SERIYA FIZIKO-TEKHNICHESKIKH NAUK in Russian No 1, Jan-Mar 78 pp 73-78 manuscript received 1 Jun 77

ANDRIZHIEVSKIY, A. A., DOLZHENKOVA, G. G., and NEMTSEV, V. A., Institute of Nuclear Energy, Academy of Sciences Belorussian SSR

[Abstract] The heat transfer during boiling of N₂O₄ is characterized by anomalies caused by the presence of both a liquid and a vapor as a result of the dissociation reaction $N_2O_4 \rightleftharpoons 2NO_2$. Unlike other plain binary boiling liquids, this system is also characterized by a constant (throughout the evaporation process) difference between the degrees of dissociation in the

liquid phase and in the vapor phase at the saturation line. On the other hand, liquid N_2O_4 always contains some NO_2 . Experimental data gathered by various authors on the heat transfer in a vertical tube with boiling N_2O_4 are generalized here in terms of referred heat transfer coefficients and the Nusselt number, according to concepts developed by S. S. Kutateladze, taking into account the effect of natural circulation during bubble boiling, shot boiling, or disperse annular film boiling under conditions of sub-cooling or saturation. Figures 2; tables 1; references 18: 16 Russian, 2 Western.

USSR

UDC 621.181.021:532

CRITERIA FOR EVALUATING THE NONEQUILIBRIUM OF A DISSOCIATIVE COOLANT DURING TRANSIENT PROCESSES

Minsk IZVESTIYA AKADEMII NAUK BELORUSSKOY SSR, SERIYA FIZIKO-TEKHNICHESKIKH NAUK in Russian No 1, Jan-Mar 78 pp 102-107 manuscript received 30 Dec 76

TASHCHILOVA, E. M. and SHAROVAROV, G. A., Institute of Nuclear Energy, Academy of Sciences of the Belorussian SSR

[Abstract] Transient processes involving a dissociative coolant with equilibrium characteristics are analyzed on the basis of a mathematical model which includes chemical nonequilibrium reactions occurring neither too fast nor too slow and thus technologically compatible with the transfer processes. This mathematical model constitutes a system of linearized and referred equations of mass conservation, specifically tailored here for N_2O_4 with the very fast first reaction and the technologically applicable second reaction. From these equations for the fourth component are calculated the time constant of oxygen evolution in a moving stream and the nonequilibrium factors characterizing the effect of the second reaction, with the first reaction generally assumed to be instantaneous. Criterial parameter complexes are subsequently established for estimating the error due to nonequilibrium in the oxygen rate and in the enthalpy change. Figures 3; references 2 (Russian).

USSR

PROBLEMS IN TRANSPORTATION OF SPENT NUCLEAR FUEL

Moscow ATOMNAYA ENERGIYA in Russian Vol 41, No 2, Feb 78 pp 150-154

KONDRAT'YEV, A. N., KOSAREV, YU. A., and YULIKOV, YE. I.

[Abstract] In the Soviet Union there is now about 7.9 million kW installed atomic electric power. One problem in the operation of these plants is the transportation of spent nuclear fuel for regeneration and the proper containerization of the latter. Transportation by train has been found to be most economical and, accordingly, this mode is discussed here in detail in terms of design, efficiency, and safety. Hybrid modes of transportation, also over highways and water routes, is more costly but inevitable, especially in traffic with other CMEA countries. Figures 2; tables 3; reference: 1 Russian.

USSR

UDC 533.9:621.039.61

A TURBULENT PLASMA BLANKET

Moscow ATOMNAYA ENERGIYA in Russian No 4, Apr 78 pp 336-339 manuscript received 30 Mar 77

VASIL'YEV, N. N., NEDOSPASOV, A. V., PETROV, V. G., TOKAR', M. Z.

[Abstract] A model of a turbulent plasma blanket is studied, under the assumption that Bohm diffusion is created in a layer of about 10cm of the plasma with coefficient $D=1/16$ (cT/eV) and that the temperature conductivity $\chi_i = \chi_e = 3D/2$. It is shown that this type of blanket can replace a diverter for removal of helium and unburned fuel from a D-T tokamak reactor, reducing the content of these impurities in the plasma. The area with artificial turbulence is selected sufficiently large so that the flux of neutral particles is low at the internal boundary. The plasma concentration and heat flux expected in future power reactors is assigned at this boundary: $n_0=10^{20} \text{ m}^{-3}$, $Q_0=1\text{MW/m}^2$. The flow of plasma from the reaction zone is significant (approximately 100 times burnup). This mode assures a small fraction of helium in the reaction zone. The turbulent blanket can maintain the concentration of impurities significantly below the lethal concentration for thermonuclear reactions. Figures 4; references 9: 6 Russian, 3 Western.

HUNGARY

DIMENSIONING AND ECONOMIC ASPECTS OF FORCED-DRAFT AIR-COOLED COOLING TOWERS

Budapest ENERGIA ES ATOMTECHNIKA in Hungarian Vol 31, No 1, Jan 78 pp 26-32

CSABA, Gabor, graduate mechanical engineer, Institute of Energy Management

[Abstract] The author investigated the potential application of high-output fans, the methods of designing cooling systems, and the criteria for selecting optimum forced-draft air-cooled cooling tower configurations. The study dealt specifically with a 220-MW unit, and also with possible applications in nuclear power plants, but the results are applicable to other output and cost conditions also, as illustrated by the application of the results to a 500-MW unit. The presently manufactured fans may be used for saturated-steam nuclear power plants in the 1,000-to 1,200-MW output range, where they are employed in conjunction with dry cooling tower systems comprising 30 to 35 cooling cells. The optimum conditions may be established on the basis of the power deficiency in the low-pressure section of the turbine and the investment costs for the cooling system. The initial cycle parameters do not affect the optimization. As a result, it was concluded that the optimization diagrams developed may be used for various types of steam turbine used in low-pressure systems irrespective of the configuration of the specific heat-consumption and output curves obtained from the initial parameters and the type of cycle. The calculations were based on a specific heat-consumption curve for a turbine with reheat, and specifically involved the ribbed heat exchangers manufactured by the Cooling System Factory. Figures 15; no references.

USSR

FREE VIBRATION MODES AND PERIODS OF REINFORCED-CONCRETE SCAFFOLDING
STRUCTURES WITH A FLEXIBLE GROUND FLOOR

Yerevan IZVESTIYA AKADEMII NAUK ARMYANSKOY SSR, SERIYA TEKHNICHESKIKH NAUK
in Russian Vol 30, No 6, 1977 pp 30-38

GOROYAN, T. A., Yerevan Polytechnic Institute imeni K. Marx

[Abstract] Free vibrations of reinforced-concrete scaffolding structures up to 16 stories tall are considered in the case of a flexible first floor and a nonlinear behavior of the material of the supporting pillars. All joists are assumed to be perfectly rigid and the pillar material to be linearly elastic with a particular value of Young's modulus within each floor. On the basis of the general expression for the stiffness of the k -th floor, with the nonlinearity factor $f_k = \frac{n+k-1}{2n}$ ($k = 1, 2, \dots, n$), and the fundamental differential equation of small vibrations for a weightless cantilever beam carrying n lumped masses, the natural periods and the form factors for structures are calculated for any number of stories from 6 through 16. The form factors take into account the elastoplastic characteristics of the concrete. The numerical data tabulated should be useful for the design of structures resistant to seismic action. Figures 1; tables 2; references: 3 Russian.

USSR

UDC 699.841.517.946

EFFECT OF THE PLIABILITY OF FLOORS AND FOUNDATIONS ON THE VIBRATIONS OF
BUILDINGS DURING EARTHQUAKES

Tashkent, IZVESTIYA AN UZ SSR, SERIYA TEKHNICHESKIKH NAUK in Russian
No 1, 1978 pp 32-35 manuscript received 27 Jan 77

MUKUK, L. K., Institute of Mechanics and Earthquakeproofness of Structures
imeni M. T. Urazbayev, Academy of Sciences Uzbek SSR

[Abstract] A study was made to discover the effect of the pliability of the floors and foundation on the dynamic characteristics of a structure including the periods of free vertical vibrations, displacement and stress occurring in any cross-section of the building. Three calculation schemes were considered which take the deformativeness of the floors into account differently, and these schemes were used to solve the problems of longitudinal vibrations of four-story brick buildings with reinforced concrete floors containing rectangular cavities with the vertical component of seismic forces acting on them represented in the form of an instantaneous pulse.

Two of the schemes involve a cantilever on a rigid or elastic foundation, bearing walls with their masses distributed over their height and concentrated masses of rigid and elastic floors, respectively. The third scheme is a cantilever on a rigid or elastic foundation, bearing walls with masses distributed over the height and over a strip beam with hinged supports for the mass of the elastic floors. The algorithm for the ALGOL-60 program used for the calculations on the M-222 computer is outlined.

In the described buildings the periods of the free vibrations increase from the first scheme to the second and from the second to the third, the maximum displacement occurring at the end of the last floor increases significantly from the third scheme to the second and from the second to the third, and the maximum stress in the foundation increases in the same sequence.

USSR

UDC 624:539.4

CALCULATING THE RIGIDITY CHARACTERISTICS, PERIODS AND FORMS OF THE NATURAL VIBRATIONS OF BUILDINGS

Tashkent, IZVESTIYA AN UZ SSR, SERIYA TEKHNICHESKIKH NAUK in Russian
No 1, 1978 pp 36-41 manuscript received 29 Oct 76

TSOY, V. P., and RAKHIMBAYEV, A. G., Tashkent Polytechnical Institute
imeni Abu Raykhan Beruni

[Abstract] In calculating the rigidity characteristics, periods and forms of natural vibrations of buildings, the authors consider a uniform vertical beam which is free on the upper end and fastened to the foundation on the lower end. Since the foundations of high-rise buildings are often in the form of a solid monolithic, ribbed reinforced concrete box attached to a solid slab, the foundation is considered to be in the form of an absolutely solid state supported on an elastic layer with respect to a planar configuration, and the building and the foundation are considered as a single mechanical system.

The differential equations of the vibrations of the system are derived, and equations are found for determining the rigidity characteristics, the generalized coefficients of an elastic foundation, the calculated periods and shapes of the system vibrations by the experimental period and shape of the natural vibrations of the building.

SPECTRAL CHARACTERISTICS OF THE SOIL UNDER THE TASHKENT AND THE TASHGRES SEISMIC STATIONS

Tashkent, IZVESTIYA AN UZ SSR, SERIYA TEKHNIЧЕСКИХ НАУК in Russian
No 1, 1978 pp 50-56 manuscript received 27 Feb 75

ABDALIMOV, E., and MIRZAYEV, V. M., Seismology Institute, Academy of
Sciences Uzbek SSR

[Abstract] A procedure is described for studying the effect of geological conditions under seismic stations on the spectrum of the volumetric waves according to which a pair of seismic stations close together are used (in the given case the Tashkent and Tashgres Seismic Stations), and earthquakes are selected with epicentral spacings many times greater than the spacings between the seismic stations. The amplitude spectra of the transverse wave are calculated for each earthquake, and the ratio of the spectra is determined for the compared stations.

The results of analyzing 13 pairs of earthquakes recorded simultaneously at the Tashkent and Tashgres Seismic Stations are tabulated, and the amplitude spectra of the transverse waves are calculated. The spectral ratio was determined for the compared stations after digitalization of the spectra, producing a punch tape and processing on the Minsk-22 computer.

The data indicate that the amplitude spectra for stations under identical soil conditions are similar in shape, the soil at the Tashkent Station has an upper loose layer leading to increased oscillation amplitudes, the frequency domains of the maxima and minima can be used instead of precisely fixed values of the frequencies because the maxima and minima of the spectral characteristics of the soil vary with respect to amplitude and frequency, and the spectral ratio is approximately 1.5 for the two indicated stations.

USSR

UDC 624.073.012.46.7

LARGE-SPAN BUILDINGS WITH PRESTRESSED REINFORCING STRUCTURES

Moscow BETON I ZHELEZOBETON in Russian No 4, Apr 78 pp 16-18

KHROMETS, YU. N., KOSTYUKOVSKIY, M. G., Central Scientific Research
Institute of Industrial Buildings

[Abstract] A description is presented of two basic types of large-span roof structures utilizing prestressed reinforced concrete structures: those with convex and concave shape of the roof. Examples are given of both types, photographs are presented, and the methods of design and assembly described. The use of this type of roofing allows large areas to be covered without internal supporting columns while simultaneously reducing the consumption of concrete and metal in the manufacture of the roof. The examples presented show possible trends for further development of design forms of roofing using prestressed reinforced concrete. Figures 3; references: 4 Russian.

USSR

UDC 621.642.3:691.328:666.9--121

PRESSURE VESSELS OF "HEAVY FERROCEMENT"

Moscow BETON I ZHELEZOBETON in Russian No 4, Apr 78 pp 37-39

SHORSHNEV, G. N., STARIKOV, O. P., Leningrad Institute of Construction Engineering, PANARIN, S. N., LenZNIIEP and RUMYANTSEV, R. M., Leningrad Institute of Construction Engineering

[Abstract] A study was conducted to develop the design of a large high pressure vessel not requiring prestressing of reinforcement but retaining the advantages of prestressed reinforced concrete construction. The basic material used in the design of the vessel was a reinforced concrete with high content of reinforcement, consisting of high strength, fine grain concrete and ordinary reinforcing wire representing 10-18% of the cross section of each element, called "heavy ferrocement." The use of this dispersion-reinforced concrete in pressure vessels provides the required strength and crack resistance. Model studies confirmed the reliability of the design selected and load deformation of the walls of the vessel when loaded by pressure. Figures 4; references: 3 Russian.

USSR

UDC 691.714+691.327--422.2:539.3/.4

STRENGTH AND DEFORMATION OF PRESTRESSED STEEL-CONCRETE BEAMS WITH EXTERNAL SHEET REINFORCEMENT

Moscow BETON I ZHELEZOBETON in Russian No 5, May 78, pp 10-12

KLIMENKO, F. YE., BARABASH, V. M., PAVLOVSKAYA, M. A., L'vov Polytechnical Institute

[Abstract] Reinforced concrete structures with external reinforcement are coming into increasing use in the USSR and abroad. However, the smooth sheet and strip steel used for this purpose does not bond sufficiently with the concrete. The authors suggested a new sheet reinforcement of periodic profile which bonds more tightly with the concrete it surrounds. On one surface, at an angle of 45° to the longitudinal axis, there are periodically repeated projections with a height of 10-20% of the thickness of the sheet. The ratio of the height of the projections to the spacing between projections is 0.13-0.2:1. Experiments confirmed the effectiveness of the use of reinforcement for both ordinary and prestressed steel-concrete elements. Figures 4; references 4: 3 Russian, 1 East European.

COMPACTION OF LOESS SOILS DURING HYDRAULIC ENGINEERING CONSTRUCTION IN DOBRUGEA

Bucharest HIDROTEHNICA in Romanian No 4, 1977 pp 78-81

AUREL BARARIU, Engineer, Ground Improvement Building Trust, Constanta

[Abstract] Compaction is of great economic interest because its cost amounts up to 10% of the total hydrotechnical (earth dam) construction expenses. Considerable experience has been gained in the compaction of loess soils in the course of hydraulic engineering construction in Dobrugea during the period from 1960 to 1976, involving the development of an irrigation system on a land surface of about 300,000 ha. About 12,000 soil specimens, ranging from cohesive dusty material to clayey soils were tested. Results of the study indicated that soils containing more than 40% clay do not satisfy the required parameters after compaction but may be used in mixtures with other types of soils. For best compaction results, the humidity W must be kept between the optimum value W_{opt} and $W_{opt} - 1.5\%$, making sure that the humidity is uniformly distributed. All conventional compacting tools may be used but the TPO and ICIF Constanta type tamping compactors yielded superior results. An efficient working technique consisted in spreading 25 to 30-cm thick layers and compacting them during 4 or 5 passes with the TPO compactor.

USSR

UDC 621.311.25:621.039:697.34 001.5

OPTIMUM PERFORMANCE OF CENTRAL HEATING SYSTEMS WITH INTRODUCTION OF ATOMIC POWER PLANTS

Minsk IZVESTIYA AKADEMII NAUK BELORUSSKOY SSR, SERIYA FIZIKO-TEKHNICHESKIKH NUAk in Russian No 1, Jan-Mar 78 pp 11-17 manuscript received 26 May 77

BRAZOVSKIY, V. P., MINKOV, V. A., and YAKOVLEV, B. V., Belorussian Department, All-Union Scientific Research and Planning Institute of the Power Engineering Industry, Belorussian Department, State Scientific Research Power Engineering Institute imeni G. M. Krzhizhanovskiy

[Abstract] The optimum central heating system, namely one most economical on the national scale, is regarded as a function of the sum of all investment costs and the sum of all operating costs. On this basis, the performance and problems of optimization are discussed in application to heat and electric power plants, boiler plants, and heating networks operating either without or in conjunction with atomic electric power plants. The need for a mathematical model is indicated, for optimizing the performance of a central heating plant operating with an atomic electric power plant, which would take into account the costs of water supply and atmospheric air decontamination. References: 5 Russian.

USSR

UDC 536.244

NONLINEAR HEAT AND MASS TRANSFER IN POROUS MEDIA

Minsk IZVESTIYA AKADEMII NAUK BELORUSSKOY SSR, SERIYA FIZIKO-TEKHNICHESKIKH NUAk in Russian No 1, Jan-Mar 78 pp 63-66 manuscript received 30 Jun 77

SURKOV, G. A. and SKAKUN, S. D., Institute of Heat and Mass Transfer imeni A. V. Lykov, Academy of Sciences Belorussian SSR

[Abstract] The heat transfer in a porous medium is calculated, such a medium being regarded as a solid-fluid system with heat transmitted through both phases. Here the second-order differential equation of steady-state heat and mass transfer is made nonlinear by letting the thermal conductivity of the porous solid and the specific heat of the fluid coolant be temperature dependent. This equation is now solved for appropriate boundary conditions, first approximately in Fourier series and then more exactly by transforming it to a higher-order differential equation. Numerical data are obtained for a porous tungsten plate with nitrogen cooling, with the thermophysical properties assumed to be linear functions of the temperature rise. Tables 2; references 9: 4 Russian, 3 German, 2 Western.

USSR

UDC 662.997:66.047

STUDY OF THERMAL CONDITIONS OF PROTECTED SOIL WITH A HIGH-TEMPERATURE HEATING LAYER

Tashkent GELIOTEKNIKA in Russian No 1, 1978 pp 49-55 manuscript received 26 Apr 77

AVEZOV, R. R. and NIYAZOV, SH. K., Physiotechnical Institute, Academy of Sciences Uzbek SSR, Tashkent State University imeni V. I. Lenin

[Abstract] A study was made of the thermal conditions of protected soil with a high temperature heating layer in the example of a hothouse with two-layer transparent film enclosure of semicylindrical shape with the drainage type subsoil heating with the heat supplied from ground water with a temperature of 40 degrees C and solar radiation. The temperature distribution of the heat-exchange agent along the heating layer and the air temperature inside the hothouse were studied, and an expression was derived for calculating this temperature distribution and the temperature distribution of the soil surface as a function of the outside air temperature, the heat engineering characteristics of the enclosure and the heat resistance of the soil.

The variation of the air temperature inside the hothouse is plotted as a function of the outside air temperature at 18 degrees C and for various values of the heat resistance of the soil, is plotted in the form of a graph. The amount of heat per running meter of the heating layer of the structure can be determined by the Vlasov method for practical calculations.

USSR

UDC 519.27+662.98.3

APPLICATION OF THE METHOD OF MATHEMATICAL EXPERIMENTAL PLANNING FOR INVESTIGATING AN INJECTION BURNER

Tashkent IZVESTIYA AN UZ SSR, SERIYA TEKHNIЧЕСКИХ НАУК in Russian No 1, 1978 pp 28-31 manuscript received 6 Jun 77

SHAKIROV, K. SH., and ESHKABILOV, KH. B., Central Asian Branch of the All-Union Scientific Research Institute of the Gas Industry

[Abstract] Studies were made by the method of mathematical experimental planning of an adjustable injection burner developed by the Central Asian branch of the All-Union Scientific Research Institute of the Gas Industry and based on the principle of swirling the gas and air mixture. The results of studying the primary parameters including the angle of rotation

of the headers around the axes, the gas pressure in front of the burner reduced to the rated value, the ratio of the cross-sectional areas of the mixing chamber and the nozzles and the pressure in the firebox, are presented and analyzed. A dispersion estimate of each series of parallel experiments was calculated and the mean value was determined.

The production testing of the model of the burner for a gas flow rate of $200 \text{ nm}^3/\text{hr}$ at the Tashkent diesel locomotive and car repair plant indicated that the requirements of the All-Union State Standard have been met.

USSR

UDC 621.18.7.662.938

PERFORMANCE OF A LOW-TEMPERATURE VORTEX FURNACE OPERATING WITH AGGLOMERATED GRIST OF TAVRICHAN BROWN COAL

Minsk IZV, ENERGETIKA in Russian No 4, Apr 78 pp 41-46 manuscript received 5 Jul 77

VOROTNIKOV, YE. G., candidate in technical sciences, lecturer, NIKIFOROV, A. A., engineer, SUKHININ, V. I., engineer, RASPUTIN, O. V., engineer, Chair of Theoretical and General Heat Engineering, Order of Labor's-Red-Banner Far-Eastern Polytechnic Institute imeni V. V. Kuybyshev

[Abstract] The now predominant mode of combustion according to the direct-flow principle requires a fine grist of solid fuel and thus involves extra energy expenditures as well as extra operating costs for pulverization equipment. Agglomeration of the fuel grist, on the other hand, degrades the ignition characteristics in this kind of combustion process. An experimental study was made to determine the feasibility of using agglomerated brown coal with the vortex furnace developed at the Leningrad Polytechnic Institute imeni M. I. Kalinin and operating by the principle of low-temperature combustion. The effect of grist mesh size on the temperature field inside the furnace and on the isorads along the furnace walls was determined in this study. The results indicate that agglomerated grist of Tavrighan brown coal can be burned efficiently in such a furnace. A lowering of the pyrometric level by 100°C and of the maximum thermal flux by 70 kW/m^2 reduces neither the stability of ignition nor the completeness of combustion. Scorification does not occur and the heat capacity of the furnace chamber is not reduced under much heavier heat loads. Figures 4; references: 1 Russian.

USSR

UDC 66.045:661.2

HEAT TRANSFER TO A VERTICAL WALL FROM A LIQUID FILM FLOWING DOWN ALONG IT AND COOLED IN THE PROCESS

Minsk IZV. VUZ, ENERGETIKA in Russian No 4, Apr 78 pp 132-135 manuscript received 10 Mar 77

ZHIVAYKIN, L. YA., candidate in technical sciences, KHOLOSTYKH, V. I., candidate in technical sciences, BLYAKHER, I. G., candidate in technical sciences, Chairs of Chemical Production Machinery and Apparatus, Perm Polytechnic Institute and Order of Labor's-Red-Banner Ural Polytechnic Institute imeni S. M. Kirov

[Abstract] The performance of film-flow heat exchangers was studied with films of water and 14-91.6% glycerin solutions in water flowing down along a vertical copper tube 1800 mm long and 28 mm in diameter. The hydrodynamic conditions were varied over the 50-15,000 range of the Reynolds number. The test results were then evaluated, with the aid of "Ural" computer, in terms of the Nusselt number $N_{Nu} = \frac{\alpha}{\lambda} \sqrt{\frac{g}{\nu}}$ and the modified Nusselt number $N_{NuM} = \frac{\alpha}{\lambda} \sqrt{\frac{g}{\nu}}^{1/3}$ (α denoting the heat transfer coefficient, λ denoting the thermal conductivity, ν denoting the kinematic viscosity, and g denoting the acceleration due to gravity), from which the heat transfer coefficient was subsequently calculated as a function of the $-1/3$ Reynolds number over four ranges: $N_{Re} N_{Re, v}$ (laminar flow $N_{NuM} = 1.88 N_{Re}^{-1/3}$), $N_{Re, v} N_{Re} 1800$ (pseudolaminar flow $N_{NuM} = 1.9 \cdot 10^{-2} N_{Re}^{0.2} N_{Pr}^{0.44}$), $1800 N_{Re} 6000$ (transitional flow $N_{NuM} = 6.7 \cdot 10^{-5} N_{Re}^{0.95} N_{Pr}^{0.44}$), and $N_{Re} 6000$ (turbulent flow $N_{NuM} = 7.8 \cdot 10^{-3} N_{Re}^{0.4} N_{Pr}^{0.44}$). The mean film thickness was also calculated on the basis of these data. The results have been applied to the design of laboratory-industrial and industrial film-flow heat exchangers for cooling sulfuric acid. The performance of prototypes has confirmed the correctness of this empirical evaluation. Figures 4.

USSR

UDC 662.997.537.22

TEMPERATURE DEFORMATIONS OF SOLAR ENERGY CONCENTRATORS

Tashkent GELIOTEKHNKA in Russian No 2, 1978 pp 20-28

KOROLEV, V. M., MACHUYEV, YU. I., NAZAROV, A., SOKOLOV, YE. V., SOLODOVNIKOVA, L. A. and FOKIN, V. G., Physicotechnical Institute, Academy of Sciences Turkmen SSR

[Abstract] Solar energy concentrators are considered as parabolic reflectors reinforced by radial and annular ribs. An investigation is made of the

deformation of such structures under the action of axisymmetric and skew-symmetric heating, using an ordinary differential equation of flexure of an isotropic shell of revolution in which the thickness term accounts for the moment of inertia of the stiffening rib and the attached covering, and also the width of the covering. For a concentrator reinforced only by radial ribs, the deformations are considerably higher than in the case of radial and circular ribs. Skew-symmetric deformations occur when the optical axis of the concentrator does not coincide with the axis of the radiant flux. Analysis of the results shows that from the qualitative side the processes of temperature deformation of concentrators under skew-symmetric strains is practically analogous to the case of axisymmetric temperature deformations. The text of the paper was presented to the All-Union Conference on the Use of Solar Energy in Ashkhabad in 1977. Figures 2, references 3 (Russian).

USSR

UDC 662.997:621.472

ON THE PARTICULARS OF USING N_2O_4 IN A SOLAR GAS TURBINE FACILITY

Tashkent GELIOTEKHNIKA in Russian No 2, 1978 pp 41-45 manuscript received 1 Jul 76

CHIKOVANI, V. V. and DZITOYEV, M. S., Leningrad

[Abstract] An estimate is made of the thermodynamic efficiency of a solar gas turbine facility that uses a chemically reacting working fluid -- gaseous nitrogen tetroxide (N_2O_4 gas)--and the optimum conditions for use of the gas in the facility are determined. The criterion of effectiveness is the thermal efficiency, which determines the thermodynamic efficiency of the heat cycle, and to some extent that of the entire facility. An evaluation is made of the feasibility of reducing the temperature of the working gas at turbine inlet by using N_2O_4 instead of a better working fluid of fixed composition -- a monatomic gas for the same values of thermal efficiency of the cycle. The results of the analysis show that N_2O_4 is a highly effective chemically reacting working fluid throughout the characteristic range of thermodynamic parameters of the solar facility. The high efficiency is due chiefly to a considerable change in composition in processes of heat exchange of the working fluid with heat sources. The cycle that is most effective for the given working fluid is one in which "frozen" expansion of the working fluid on the turbine is realized. This reduces the advisable pressure expansion ratios and increases efficiency. The use of N_2O_4 enables a reduction in the maximum temperature of the cycle without reducing efficiency as compared with a fixed-composition working fluid. Figures 5, references 8 (Russian).

THERMAL CALCULATION OF THE REACTOR OF A SOLAR-POWERED ENERGY FACILITY FOR
THERMOLYSIS OF WATER TO PRODUCE HYDROGEN

Tashkent GELIOTEKHNKA in Russian No 2, 1978 pp 69-73 manuscript received
28 Mar 76

SHAKHBAZOV, SH. D. and RZAYEV, P. F., Azerbaydzhan Polytechnical Institute
imeni Ch. Il'drym

[Abstract] Heat engineering calculations are done on a reactor used for thermal dissociation of water. The temperature produced by parabolic reflectors in the solar reactor is 2000°C. At this temperature the material of the chamber must be high-melting, inexpensive, easily machined, strong, gas-tight, resistant to oxidation at high temperatures, and have high thermal conductivity. The last requirement rules out ceramics, and most high-melting metals are scarce and expensive. This narrows the choice down to four metals: molybdenum, niobium, titanium and tungsten. But these oxidize rapidly and for that reason are not suitable either. It is concluded that the only materials that meet all requirements are nuclear and electrode graphites. Practical difficulties restrict the optimum shape to a hollow cylinder. The temperature distribution lengthwise of the reactor is found from solution of a differential equation of heat conductivity for a rod of finite length with fixed cross section. References 6 (Russian).

ROMANIA

AGAINST THE USE OF α , THE CONVECTIVE HEAT-EXCHANGE COEFFICIENT

ENERGETICA Vol 25, No 1, 1977 pp 37-9

STAIKU, C. I., Dr Eng., ICEMENERG

[Abstract] In view of the complex nature of heat transfer by convection, Newton proposed in 1701 the following relation for calculating the heat flux q : $q = \alpha S(\theta_s - \theta_l)$ for a surface S and temperatures of θ_s and θ_l of the solid and liquid. The coefficient α , which includes most of the parameters involved in the process, has been determined experimentally. The author proposes that this coefficient be eliminated and the heat transfer by convection be handled by using the physical factors involved in the process. This coefficient is not a physical magnitude; it is only a symbol which expresses the correlation between the heat transfer and the physical parameters. Its elimination would promote a more profound theoretical study of the problem, reducing the need for expensive experimentation.

USSR

UDC 621.472

STUDY OF THE SHIELDING EFFECT OF THE PRODUCTS OF RADIANT DESTRUCTION OF MATERIALS

Tashkent GELIOTEKHNICA in Russian No 1, 1978 pp 41-48

UMAROV, G. YA., SOKOLOVA, YU. B., SINYAREV, G. B., and PETRIKEVICH, B. B.

[Abstract] The processes of radiant destruction of heat shielding materials and the shielding effect of the products of the destruction were investigated experimentally. The optical characteristics of the medium containing the products of destruction were determined on a special test unit, and the procedure was developed for calculating the shielding effect of the gaseous medium with disperse particles from heating the materials by a radiant flux. The attenuation and dispersion coefficients for various concentrations and different initial radiant fluxes were calculated as 30 to 160 watts/cm². The necessity for considering the presence of the suspended particles of the products of destruction in the wall layer is confirmed by the theoretical model constructed for calculating the radiant heat exchange.

USSR

UDC 534.222

A POINT EXPLOSION IN A COMPRESSIBLE MULTICOMPONENT MEDIUM

Novosibirsk ZHURNAL PRIKLADNOY MEKhanIKI I TEKHNIChESKOY FIZIKI in Russian No 2, Mar-Apr 78 pp 105-109 manuscript received 11 Mar 77

MASLENNIKOV, A. M., FETISOV, V. S.

[Abstract] A study is made of self-similar methods of solution of hydrodynamic equations which reduce the problem of the movement of a compressible medium following a point explosion to the investigation of ordinary differential equations. The study is limited to the case of a strong explosion, and pressure before the leading edge of the shock wave is ignored. The problem is thus self-similar, and all of the quantities describing the movement of the medium depend on a single variable. The picture of the behavior of pressure, velocity and density developed leads to an increase in the specific energy of the medium after passage of the shock wave, leading to more rapid attenuation of the shock wave with distance, i.e., a decrease in the peak pressure with an increase in the content of water and gas in the medium at identical distances from the explosion point. Figures 4; references 6 (Russian).

USSR

UDC 627.8.034.93:691.175

EPOXY-COAL HYDRAULIC INSULATION FOR STRUCTURES OF THE NUREK HYDROELECTRIC POWERPLANT

Moscow GIDROTEKHNICHESKOYE STROITEL'STVO in Russian No 3, Mar 78 pp 13-17

SAKHAROV, V. I., SEGAL', M. S., SOLOV'EV, I. N., YAZEY, R. E.

[Abstract] The design of the Nurek Powerplant exposed the base of the core of the dam to a head of 270m. To avoid seepage, it was decided to construct an antiseepage screen. Given the total hydraulic insulation area required, $26,540\text{m}^2$, the use of a metal screen would be quite expensive. It was therefore decided to use an epoxy-coal material consisting of a primer, varnish and enamel based on epoxy resins modified by the addition of coal tar, a waste product from the dry distillation of coal. A typical hydraulic insulation layer consists of a coat of primer, three or four coats of varnish and a coat of enamel. Glass-reinforced fabric is used with the first through third coats of varnish to increase crack resistance. The coating thus produced is found to be resistant to overbearing soil pressure of up to 600 t/m^2 , hydrostatic head of up to 300 m and constant shear forces of up to 100 t/m^2 . The method also saves labor and expensive metal. Figures 6; tables 3; references 6 (Russian).

USSR

UDC 532.516

ONE CLASS OF AXISYMMETRICAL UNSTABLE FLOWS OF A VISCOUS, INCOMPRESSIBLE FLUID

Novosibirsk ZHURNAL PRIKLADNOY MEKHANIKI I TEKHNICHESKOY FIZIKI in Russian No 2, Mar-Apr 78 pp 59-66 manuscript received 23 Aug 76

YARMITSKIY, A. G.

[Abstract] A study is made of twisted flows of an incompressible fluid with axial symmetry. The kinematics of an axisymmetrical twisted flow of an incompressible, viscous fluid are fully described by the equation system produced, a result of the Navier-Stokes vector equation. Next, a class of axisymmetrical flows of viscous fluid is analyzed for which function C is proportional to the flow function Ψ . This flow can be represented as a superposition of two flows: a helical flow and a flow defined by the flow function $k^{-2}Ar^2$. A circular cylinder of infinite length and radius a , within which the twisted flow of viscous liquid moves, is assumed to advance along its axis and rotate around this axis

at a constant angular velocity. In this case, the flow is cylindrical and the task is to determine the parameters of the flow. An equation is derived for the flow function in the cylindrical channel. References 7: 6 Russian, 1 Western.

USSR

UDC 532.516

A METHOD OF SOLVING PROBLEMS IN THE HYDRODYNAMIC THEORY OF LUBRICATION AT HIGH VALUES OF THE REYNOLDS NUMBER

Minsk IZVESTIYA AKADEMI NAUK BELORUSSKOY SSR, SERIYA FIZIKO-TEKHNICHESKIKH NAUK in Russian No 1, Jan-Mar 78 pp 119-124 manuscript received 11 Mar 77

SMAGA, T. I., SMIRNOV, B. I., and STEPANYANTS, L. G., Institute of Heat and Mass Transfer imeni A. V. Lykov, Academy of Sciences Belorussian SSR

[Abstract] Plane laminar flow of an incompressible fluid through a long clearance channel is considered, the width of this channel being much smaller than its length and than the radii of local wall curvatures. The equations of motion are constructed in rectangular coordinates with appropriate boundary conditions applicable to a lubrication system. There are four rather than three necessary conditions with respect to the transverse coordinate and, moreover, the pressure is not a function of this coordinate. These equations are transformed, by change of variables, to universal equations corresponding to the two-dimensional theory of hydrodynamic lubrication with high values of the Reynolds number and these equations are then solved in parametric approximations, i.e., by integrating piecewise with respect to a finite number of parameters from one up. This method is illustrated here on the example of a steady flow of an incompressible fluid through a variable-section channel. Typical velocity profiles are shown which have been obtained with the aid of a Minsk-32 computer. The parametric method of calculation was developed by L. G. Loytsyanskiy. Figures 4; references 4 (Russian).

USSR

UDC 532.135+539.3

FLOW OF A VISCOELASTIC FLUID OF THE AFTEREFFECT TYPE BETWEEN PARALLEL DISKS UNDER PULSE LOADS

Minsk IZVESTIYA AKADEMII NAUK BELORUSSKOY SSR, SERIYA FIZIKO-TEKHNICHESKIKH NAUK in Russian No 1, Jan-Mar 78 pp 125-130 manuscript received 7 Sep 77

LAMBINA, YE. N., and LAPUSHINA, B. I., Belorussian Polytechnic Institute

[Abstract] A viscoelastic incompressible fluid characterized by the rheological equation $s = 2\eta \int_0^t \mu(t-\tau) e(\tau) d\tau$ is considered (s denoting the stress deviator, e denoting the strain-rate deviator, $\mu(\tau)$ denoting the relaxation function, τ the time coordinate, and t the total time). This fluid flows through a narrow gap between two parallel disks, one of them moving at a constant velocity under a pulse load. This flow is assumed to be sufficiently slow for disregarding the convective terms in the equation of motion. The problem is solved for zero initial conditions (velocity and stress), first for an arbitrary model and then for an n -component model of a Maxwell body: pressure, velocity components, and stresses are calculated by applying the Laplace transformation to the equation of motion which corresponds to the Stokes equation for transient flow of a viscous fluid without body forces, in cylindrical coordinates and taking into account the axial symmetry. The authors thank Z. P. Shul'man for suggesting the topic and taking interest in this study. Figures 1; references 5: 2 Russian, 1 German, 2 Western.

USSR

UDC 621.224.2.01

APPLICABILITY OF THE ENERGY BALANCE EQUATION TO AN ANALYSIS OF KINEMATIC AND ENERGY CHARACTERISTICS OF A WATER TURBINE

Minsk IZV. VUZ, ENERGETIKA in Russian No 2, Feb 78 pp 112-118 manuscript received 24 Jun 77

GRYANKO, L. P., candidate in technical sciences, lecturer, PYLEV, I. M., candidate in technical sciences, Order-of-Lenin Leningrad Polytechnic Institute imeni M. I. Kalinin

[Abstract] In order to solve the forward axisymmetric problem of flow in a water turbine on the basis of the equations of motion, it is necessary to stipulate boundary conditions usually established experimentally. Here these conditions are established, i.e., the meridional entrance and exit velocities at the blade edges are calculated on the basis of the variational

principle referring to the maximum energy flux through the exit section. The geometry of the flow-through stage and the loss factors as well as the runner speed and also the direction of the stream relative to the entrance edge are all given. For simplification, furthermore, the blading is assumed to consist of an infinitely large number of infinitesimally thin buckets. The thus obtained meridional velocities are useful for calculating the absolute velocities as well as for analyzing the effect of geometric design parameters on the stream characteristics and on the runner performance. Calculated changes in the velocity profile due to changes in the operating conditions have been confirmed experimentally. The quantitative agreement between theoretical and experimental results will depend on the assumed values of the loss factors. Figures 4; references 6 (Russian).

USSR

UDC 627.8:624.131.6

SEEPAGE THROUGH THE CONCRETE OF THE UPSTREAM FACE OF THE UST'-ILIM
HYDROELECTRIC POWERPLANT DAM

Moscow GIDROTEKHNICHESKOYE STROITEL'STVO in Russian No 3, Mar 78 pp 17-19

SHAUKIN, B. V. and IVANILOVA, T. N.

[Abstract] Since the Ust'-Ilim reservoir was filled in October of 1974, measurements have been made of the quantity of water seeping through cracks and seams in the upstream face of the dam. The measurements are conducted by intercepting the water with a polyethylene film and draining the water into a calibrated vessel. The quantity of water seeping through a known area in one minute is measured. With seepage rates of over 40 l/min, the error is not over 10-15%. At lower seepage rates, the error is still less. It has been found that the variation in seepage rates depends on the temperature of the concrete of the upstream face of the dam and the level of water in the backwater pool. The maximum seepage occurs in February-March, the minimum in September-October. The seepage rate in February of 1976 was 20 l/s, in February of 1977, 7 l/s, primarily a result of cementation of cracks in the spring of 1976. Physical leaching of lime has occurred in all of the cracks studied. Figures 2; tables 3; references 2 (Russian).

USSR

UDC 621.922.02

TECHNOLOGY OF FINISHING HIGH-ALLOY STEELS

Moscow IZV. VUZ, MASHINOSTROYENIYE in Russian No 4, Apr 78 pp 149-153
manuscript received 4 Jul 77

KOMAROV, V. V., candidate in technical sciences, lecturer, SAKHAROV, V. V.,
graduate student, Moscow Higher Technical School imeni N. E. Bauman

[Abstract] Elastic machine elements such as bellows are made of 36NKhTYuM8 high-precision alloy, which requires a careful finishing. This treatment includes removal of the defective surface layer and reduction of the surface roughness to below $2.5 \mu\text{m}$. The finish-grinding technology with a special abrasive wheel is analyzed here in terms of process variables and cost optimization, including such factors as cutting forces, cutting time, and speeds. On the basis of a semiempirical analysis, most economical grinding of elastic steel ribbon is either by a multipass operation including reversals (2-3 passes, if ribbon can be ground in both directions) or by a single-pass operation (if ribbon cannot be ground in both directions). The article was submitted by Prof. A. M. Dal'skiy, doctor of technical sciences, Moscow Higher Technical School imeni N. E. Bauman. Figures 1; tables 2.

USSR

UDC 621.746.58

A METHOD OF MAKING LOW-ALLOY STEEL CASTINGS

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI in Russian No 17, 1978 pp 33-34

[Description of Author's Certificate No 605688 Division B, filed 15 Mar 76, published 5 May 78]

ZATULOVSKIY, S. S., KIRIYEVSKIY, B. A., IVANOVA, R. K. and PESCHANIKOV, YU. I., Institute of Casting Problems, Academy of Sciences UkrSSR

[Text] This Author's Certificate introduces a method of making low-alloy steel castings that involves teeming carbon steel into a mold at a specific rate of $0.01\text{-}1.0 \text{ kg/cm}^2 \cdot \text{s}$ and adding granulated dopants with grain size of $0.5\text{-}5.0 \text{ mm}$ in the form of ferromanganese. As a distinguishing feature of the method, the physical and mechanical properties of the castings are improved by increasing the efficiency of the alloying process. Simultaneously with the ferromanganese, the carbon steel is doped with a ferrosilicon alloy containing 50-60% silicon, the total amount of the added dopants comprising 0.5-3.0% of the weight of the treated steel.

USSR

UDC 661.424.2

A METHOD OF DRYING COATINGS OF SELF-VULCANIZING COMPOUNDS

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
in Russian No 17, 1978 p 122

[Description of Author's Certificate No 606053 Division F, filed 21 Oct 76,
published 5 May 78]

SLOBODKIN, L. S. and PSHENICHNAYA, G. N., Institute of Heat and Mass
Exchange imeni A. V. Lykov

[Text] This Author's Certificate introduces a method of drying coatings of self-vulcanizing compounds such as KLT-30 applied on the surface of items by heat treatment. As a distinguishing feature the drying is intensified and the properties of the coatings are stabilized by doing the heat treatment in two stages: in the first stage, heating is done at a rate of 1.5-3°C/minute to a temperature 5-10°C lower than the boiling point of the products of polycondensation, followed by holding at this temperature for 1.5-2 hours; in the second stage, heating is done at a

USSR

UDC 621.357

A METHOD OF MAKING A DIAMOND-BEARING TOOL

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
in Russian No 17, 1978 p 42

[Description of Author's Certificate No 605719 Division B, filed 22 Nov 76,
published 5 May 78]

KLIMOV, M. D. and KONYAYEV, YU. S., "Order of the Red Banner of Labor"
Institute of High-Pressure Physics, Academy of Sciences USSR

[Text] This Author's Certificate introduces a method of making a diamond-bearing tool that involves preparation of a charge with subsequent cold and hot pressing in a mold. As a distinguishing feature of the method, the durability of the tool is increased by using a charge with and without diamonds. During cold pressing, the diamond-bearing charge is pressed to a relative density 5-20% greater than that of the charge without diamonds, and before hot pressing the intermediate workpieces are placed in the mold with the diamond-bearing layers oriented one over the other.

rate of 1-1.5°C per minute to a temperature 10-20°C lower than the onset of destruction of the coatings, followed by holding at this temperature for 4-6 hours.

USSR

UDC 541.15

COMPLEX RADIATIVE PURIFICATION OF WASTE WATER IN THE PULP AND PAPER INDUSTRY

Minsk IZVESTIYA AKADEMII NAUK BELORUSSKOY SSR, SERIYA FIZIKO-TEKHNICHESKIKH NAUK in Russian No 1, Jan-Mar 78 pp 21-25 manuscript received 26 May 77

PETREV, YE. P., KOVALEVSKAYA, A. M., SHLYK, V. G., VANINSKAYA, YU. M., ZHALEYKO, G. A., and STEBUNOV, O. B., Belorussian State University imeni V. I. Lenin, Institute of Nuclear Energy, Academy of Sciences Belorussian SSR, Joint Scientific and Industrial Institute of the Pulp and Paper Industry

[Abstract] The government of the Soviet Union has allocated 11 billion rubles annually, over the 1976-80 period, for environmental protection. Scientific methods of implementing this program include combined radiation and chemical treatment of waste water such as that in pulp and paper plants. Here are reported experimental results of combining the use of gamma radiation (from a Cs¹³⁷ source) and monomer additives (methyl acrylate, butyl methacrylate, vinyl acetate, acrylonitrile, methyl methacrylate, or acryloamide) for reducing both chemical and biochemical oxygen consumption by cellulose fibers and dyes as well as leaching lye in the waste water. Data are shown on the clarification of dissolved 1% black leaching lye, as a function of the absorbed radiation dose over the 0.04-0.3 Mrad range, without and with additives in concentrations varying from 0.2 to 7%. The effectiveness of these monomer additives is quite evident, especially at small radiation doses. A spin-off of this purification process is foreseen in the utilization of polymer residues in the waste water, including materials produced by this radiative and chemical modification of lignin. Figures 4; references 5: 4 Russian, 1 Western.

USSR

UDC 621.515.001.5:621.922.025.004.6

CONSIDERATION OF ABRASIVE DUST WEAR OF IMPELLERS DURING PLANNING OF
CENTRIFUGAL COMPRESSORS

Leningrad ENERGOMASHINOSTROYENIYE in Russian No 1, 1978 pp 19-21

RIS, V. F., Neva Plant imeni Lenin

[Abstract] A study is made of the abrasive wear of centrifugal compressors designed for compression of natural gas. The phenomenon of abrasive wear by dust contained in the gas is a very complex process, and therefore the authors attempt approximate solution by derivation of analytic equations for wear of the vanes of the impeller as a function of the basic parameters of the impeller and the gas being compressed. It is found that when the gas has a high dust content, impellers with high vane angles (50-90°) should be avoided. The optimal vane angle is 32°. The conclusions reached in this mathematical study require testing on a relatively large-scale test stand, but lead to a number of valuable conclusions concerning the parameters of the compressor and its impeller on vane wear. Figures 2; table 1; references 4 (Russian).

USSR

UDC 620.193.4:661.322.1

STUDY OF THE CORROSION RESISTANCE OF STRUCTURAL MATERIALS IN A CAUSTIC
SODA PRODUCTION MEDIUM

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 2,
pp 22-24

BABKINA, V. YU., CHUB, YE. G., VASIL'YEVA, I. K., GAPUNINA, O. V. and
KOGAN, YE. I.

[Abstract] The corrosion rates of steels type 20, 12Kh18N10T, 08Kh18N10T, 20Kh23N18, 15Kh25T, 08Kh22N6T, 12Kh21N5T and copper type M1 were studied as functions of temperature and concentration of caustic soda solution containing NaCl, NH₄Cl, Na₂CO₃, Fe²⁺, Fe³⁺, Na₂S₂O₃ and oxygen. Specimens were cut from pipes of the materials being studied. It is found that the formation of local corroded spots on copper pipe results from low quality of the metal and from mechanical stresses applied during rolling. The use of copper pipe in steel and cast-iron apparatus does not influence corrosion of the pipe, but it does intensify corrosion damage to the apparatus. Cast-iron is preferable for this service, since it is not subject to corrosion cracking in NaOH solutions. Corrosion can be reduced by reducing the

content of oxygen and ammonia in solutions, reducing the boiling point by evacuating apparatus, preventing copper recrystallization during heat treatment of pipes, rolling of pipe with minimum deformation of the metal, reducing internal stresses in the metal and stabilizing the operating modes of apparatus. Figures 2; table 1.

USSR

UDC 621.694.2.069

CHARACTERISTICS OF A LOW-HEAD GAS EJECTOR

Minsk IZV. VUZ, ENERGETIKA in Russian No 2, Feb 78 pp 75-79 manuscript received 20 Dec 76

GARBUZ, A. A., engineer, TONKONOGIY, YU. L., candidate in technical sciences, lecturer, Odessa Technological Institute of the Refrigeration Industry

[Abstract] The effect of the nozzle inlet geometry on the performance characteristic of a gas ejector, namely its ejection-ratio versus pressure-drop curve, was evaluated on a test stand specially modified for this purpose. The circulation channel had been enlarged to allow for a wide range of flow and discharge rates. Tested were converging 90° straight conic nozzles as well as nozzles with a Vitoshinskiy profile and nozzles with a "quarter circle" profile. The results differ appreciably, by as much as 35%, from those based on calculations according to conventional formulas. Conic nozzles are found not to be optimal. With special profiles, on the other hand, up to 5% higher ejection ratios are attainable. The distance from nozzle to mixing chamber entrance does not significantly affect the ejection ratio, as long as coaxiality is maintained, and, therefore, mixing chambers with a smaller length-to-diameter ratio can be recommended. Figures 2; tables 1; references 6 (Russian).

USSR

FEASIBILITY OF USING A COMPUTER FOR AUTOMATION OF THE TECHNOLOGICAL PROCESS
OF FABRICATING INTRICATELY SHAPED PARTS WITH ELECTRIC-EROSION MACHINE-
TOOL CUTTERS

Kishinev ELEKTRONNAYA OBRABOTKA MATERIALOV in Russian No 2, Mar-Apr 78
pp 5-8

ZOLOTYKH, B. N., SUSHCHINSKIY, I. M., MEL'DER, R. R., MITROFANOV, S. A.
and PATSI, A. V., Moscow

[Abstract] The present trend in electric-erosion cutting of intricately shaped parts with plainly shaped electrode wires is toward increased automation of this technological process by sequential production control with the aid of minicomputers and microprocessors. On the other hand, the feasibility of automating by group control is also to be considered. Only two variants of such a system are examined here: with the computer controlling directly all machine tools in the group, or through mutually independent interpolators assigned each to one machine tool. Programmed control from a general-purpose computer according to a unified code is found not to be a rational arrangement in this case. The general approach to a group control system is analyzed here in terms of basic tradeoff between maximum productivity of each machine tool and maximum utilization of the control system. This requires a computer for simulation, such as a MINSK-22 programmed in the algorithmic FORTRAN language, and a control computer with characteristics best matching those of the control objects. Programming the controlled operations in XY-coordinates from an appropriate number of reference points has been found to be most effective and an ELEKTRONIKA 100-I minicomputer to be most suitable for this purpose. Computer economy, conversely, needs to be considered in the design and dimensioning of parts for automatic electric-erosion fabrication. Figures 3; references 4: 3 Russian, 1 Czechoslovak.

ELECTROMAGNETIC FIELDS AND FORCES AFFECTING THE COIL HEADS OF LARGE
TURBOGENERATORS UNDER STEADY-STATE OPERATING CONDITIONS

Moscow ELEKTROTEKHNIKA in Russian No 5, May 78 pp 20-22

VAZHNOV, A. I. (deceased), doctor of technical sciences, professor, GORDON, I. A., candidate in technical sciences, GOFMAN, G. B., candidate in technical sciences, KHUTORETSKIY, G. M., candidate in technical sciences

[Abstract] An accurate method of calculating the electromagnetic field in large turbogenerators has been developed, with a special set of computer programs, for the purpose of refining the design of such machines with regard to minimum manufacturing cost and maximum performance reliability. A crucial item are the two end zones including coil heads, especially in 2-pole machines. The results of design calculations depend largely on the simplifying approximations made here. In the first stage of calculations by this method an attempt was made to establish the forces acting on the coil heads and, therefore, eddy currents in thrust plates and end shields were disregarded. The distributions of magnetic field components were determined, accordingly, with applicable conventional boundary conditions. The electromagnetic forces (axial, radial, and tangential) could then be calculated as respective products of current densities by magnetic inductions. The method is accurate enough for engineering applications. The forces on coil heads are found to vary appreciably over the conductor height, but their distribution and magnitude do not change appreciably under short-circuit transients. They do increase, however, with increasing nominal power for which a machine is designed. It has been possible to reduce the forces on the coil heads of a 1200 MW turbogenerator by way of a special winding design. Figures 3; references 4: 2 Russian, 2 Western.

EFFECT OF CLOSED FORCED CIRCULATION OF A STEAM-AIR MIXTURE IN A SOLAR
DESALINATING UNIT

Tashkent GELIOTEKHNKA in Russian No 2, 1978 pp 50-52 manuscript
received 23 May 76

SEYITKURBANOV, S. and RABINOVICH, L. I., Physicotechnical Institute,
Academy of Sciences Turkmen SSR

[Abstract] Experiments were done on closed forced circulation of a steam-air mixture under full-scale conditions in two sections of a solar desalination facility on the solar engineering test grounds of the Physicotechnical Institute of the Turkmen Academy of Sciences. A circulating blower in an enclosed housing was located over the center of the evaporative surface. As the blower operates, steam-air mixture is drawn from beneath into the housing and is raised to the glassed-in surface and split on the glass into two flows, each going to its own end of the desalinating unit. The results of the experiments showed conclusively that forced circulation in an enclosed space increases the productivity of the desalination unit. Further experiments are needed to define more precisely the problems of optimization of the process, including determination of periodicity, intensity and duration of the forced circulation and so on. Figure 1.

ROMANIA

DESIGN OF MECHANICAL STRUCTURES OPERATING UNDER CONDITIONS OF CREEP ON THE BASIS OF RELIABILITY THEORY

ENERGETICA Vol 25, No 1, 1977 pp 8-18

MAZILU, E., engineer, Institute of Metallurgical Research

[Abstract] Economic and safety factors must be correlated in the development of the optimum design for steel pipes and other structures operated under conditions of creep. Reliability theory was used as the basis of calculation. It was shown that the mechanical strength of heat-resistant steels is a random property which may be determined statistically on the basis of the Weibull distribution to derive the true dispersion of the strength of the material. This makes it possible to use reliability theory as a design tool for heat-resistant piping systems, to obtain a safe and economical mechanical structure.

YUGOSLAVIA

FIRST YUGOSLAV SYMPOSIUM ON INDUSTRIAL ROBOTS AND MANIPULATORS

Belgrade TEHNIKA in Serbo-Croatian No 4, 1978 pp 581-582

VUKOBRATOVIC, MIOMIR, Doctor of Engineering, and GLIGORIC, BRANKO, Doctor of Engineering

[Abstract] The symposium, organized by the Michael Pupin Institute and the Institute for Machine Mechanics of the Machine Faculty Institute in Belgrade, was held 24-26 November 1977. The 60 participants included specialists and scholars from the Soviet Union, West Germany, Great Britain, France, Poland, Hungary and Japan, as well as domestic experts. Automation and flexibility received attention among the papers presented. Other topics included first generation robots, which lack adaptability and require special work environments, second generation robots that are "aware" of the dimensions of their work environment, and third generation robots which employ tactile, optical and sound sensors in their operations. Of the 20 papers, 12 came from Yugoslav researchers. A round table discussion at the conclusion suggested such topics for further work as training of personnel and advanced training courses, and the need for further interchange between specialists. The proceedings of the symposium will be published. One figure.

USSR

UDC 669.14.018.252.3

INTERRELATION BETWEEN DRILL LIFE AND WEAR RESISTANCE OF HIGH-SPEED TOOL STEELS

Moscow IZV. VUZ, MASHINOSTROYENIYE in Russian No 4, Apr 78 pp 156-159
manuscript received 3 Mar 77

STUDENNIKOV, G. V., engineer, KOTLIKOVA, A. L., candidate in technical sciences, lecturer, DANILENKO, B. D., candidate in technical sciences, lecturer, Kurgan Institute of Machine Design

[Abstract] In a continuation of the study begun by G. I. Granovskiy at the Moscow Higher Technical School imeni N. E. Bauman, drills made of high-speed tool steels (grades R6M5, R6M5K5, and R12F3) were tested for wear resistance and life. The drill life was measured in numbers of holes made in chromium steels (grades 45Kh, 38Kh5, and 2Kh13) or in carbon steel (grade 45). According to the results of this study, the drill life peaks at a certain cutting speed which for all three grades of tool steel fall within the 10-20 m/min range. Meanwhile, the wear resistance peaks at a certain sliding speed which for all three grades fall within the 30-40 m/min range. The sliding speed which corresponds to maximum wear resistance is thus higher than the cutting speed which corresponds to longest drill life. The test results also indicate that grade 45 carbon steel is about 5 times more machinable with drills of high-speed tool steels than is grade 2Kh13 chromium steel. Drills made of grade R12F3 vanadium steel have a longer life at lower cutting speeds, while drills made of grade R6M5K5 cobalt steel have a longer life at higher cutting speeds, and drills made of grade R6M5 steel have the shortest life of all. The article was submitted by lecturer Yu. A. Rozenberg, candidate in technical sciences, Kurgan Institute of Machine Design. Figures 2.

USSR

UDC 669-157.8:620.172.24

KINETICS AND MICROMECHANISM OF FRACTURE IN EI702 AND EP52 STEELS

Kiev PROBLEMY MASHINOSTROYENIYA (Collection of Articles) in Russian No 4, 1977 pp 19-27 manuscript received 30 Dec 75

GUZ', I. S. and GAZOV, V. I., Institute of Problems in Machine Design, Academy of Sciences Ukrainian SSR

[Abstract] A study was made of dispersion hardened steels to determine the effect of the crystal structure on their fracture under pulse loads. Specimens of industrial steel grades EI702 and EP52, 100x6x1 mm³ large,

were heat treated by homogenization annealing under vacuum at 1150 and 1200°C for 2 h and then quenching in water at room temperature so as to produce a supersaturated solid solution of the γ -phase. These specimens were subsequently tested under tension till rupture. The fracture zone was then isolated by sawing V-notches, the fine structure of the fracture surface was examined by electrofractography on single-step carbon replicas, and hardness was measured with a Rockwell tester. The results indicate that fracture of a dispersion hardened steel can be ductile, hybrid, or quasi-brittle. The parameters of the fracture kinetics vary, depending on the amount and the size as well as the composition of the dispersed phases. The micromechanism of fracture at high cracking rates provides for retention of some "natural" ductility of the matrix. Figures 6; tables 1; references 8: 6 Russian, 2 Western.

USSR

UDC 621.039.553

ROLE OF RADIATIVE-THERMAL AGING IN INTERGRANULAR OXIDATION OF CHROMIUM-NICKEL STEELS IN AN N_2O_4 ATMOSPHERE

Minsk IZVESTIYA AKADEMII NAUK BELORUSSKOY SSR, SERIYA FIZIKO-TEKHNICHESKIKH NAUK in Russian No 1, Jan-Mar 78 pp 31-36 manuscript received 11 Apr 77

DERGAY, A. M., KOROTOV, V. F., GOL'TSEV, V. P., KOPETS, Z. V., and FEDYUSHIN, YE. YE., Institute of Nuclear Energy, Academy of Sciences Belorussian SSR

[Abstract] In an earlier study grade Kh16N15M3B chromium-nickel steel and, to a lesser extent, grade 08Kh18N10T steel have revealed intergranular surface oxidation after 1500 h of aging in an N_2O_4 atmosphere at 823 K. Neutron irradiation of these grades of steel (most widely used in atomic power plants) under the same conditions was found not to cause intergranular oxidation, contrary to well established concepts about neutron irradiation lowering the corrosion resistance of steel. This has been confirmed by an electron-microscopic structural and phase analysis, and is here further explained on the basis of carbide ($Cr_{23}C_6$) and carbonitride $Nb(C,N)$ buildup and precipitation kinetics, depending on the carbon concentration and described by respective differential equations for the aging rate. Evidently, neutron irradiation carries the aging process to farther stages than heat alone. As a result, the temperature-dependent phases form at lower temperatures and the corresponding structure has a high resistance to intergranular oxidation in an N_2O_4 atmosphere. Figures 2; references 11: 9 Russian, 2 Western.

USSR

UDC 620.17.251.2

CONCERNING THE QUESTION OF DESTRUCTION OF A TITANIUM-ALUMINIZED COATING
IN THE PROCESS OF HIGH-TEMPERATURE CREEP IN GASEOUS AMMONIA

Kiev PROBLEMY PROCHNOSTI in Russian No 2(104), Feb 78 pp 54-55 manuscript
received 10 Mar 77

UMANSKIY, E. S., ANTRAPTSEV, I. V., MARUSIY, O. I., GORDON', G. N. and
KUSHKOV, V. D., Kiev, Institute of Strength Problems, Ukr Academy of
Sciences

[Abstract] An investigation is made of the durability of grade 45 steel specimens with a two-layer titanium-aluminized coating at high temperatures in gaseous ammonia. The specimens were 3 mm in diameter with a working section 20 mm long. The thickness of the aluminized layer was 180 μm , and that of the titanium layer -- approximately 30 μm . The test facility provides for loading specimens up to 100 kgf, heating up to 1500°C and producing an aggressive medium in the working zone. The heating system is a zero-lag optical furnace in the form of an elliptical cylinder with the source of radiation at one focus and the specimen at the other. Metallographic and x-ray microstructural analysis shows that secondary structures enriched with aluminum are formed in the coating in the process of high-temperature deformation. It is established that platelet aggregations of secondary phases are sources of origination and propagation of cracks. Grade 45 steel protected with an aluminized-titanium coating is suitable for one-time use at temperatures of 700-800°C under loading in gaseous ammonia. Without the coating this material could not be used under these conditions. Figures 2; references 5 (Russian).

USSR

UDC 620.179.16

ACOUSTIC PROPERTIES OF STAINLESS STEEL WITH INTERGRANULAR DEFECTS

Sverdlovsk DEFECTOSKOPIYA in Russian No 2, Feb 78 pp 12-19 manuscript
received after revision 29 Jun 77

PRIKHOD'KO, V. N., Moscow Institute of the Petroleum and Natural Gas
Industry imeni I. M. Gubkin

[Abstract] Intergranular corrosion develops nonuniformly in stainless steel, which has a high corrosion resistance, so that the defect depth may be different in each sounded zone and it is difficult to establish a correlation between defect depth and signal pulse amplitude. Here the

effect of intergranular corrosion on the acoustic properties of a metal is analyzed in terms of a theoretical model of a defective layer constituting a finely stratified medium, with alternate layers of two different thicknesses: equal to the mean grain diameter and equal to the mean width of an intergranular microcrack respectively. The relative change in velocity and the damping coefficient characterizing transmitted and reflected elastic waves in this model agree closely with experimental data obtained for grade 12Kh18N10T steel with ultrasonic pulse-echo instruments by the contact method and the immersion method, including measurements with longitudinal and transverse waves, except that this model accounts neither for the diverse orientation of grain boundaries along the sounding path nor for the statistical nature of grain and microcrack dimensions. An analysis based on this model indicates that the acoustic properties of defective and nondefective stainless steel differ sufficiently to make stainless steel with intergranular corrosion representable as a two-layer system. Although the acoustic velocity and the damping coefficient are different in each layer, the boundary between the layers is soft and random so that, in effect, the transition is a smooth rather than sudden one and the parameters change gradually rather than jumpwise. Figures 6; references 7: 6 Russian, 1 Western.

USSR

UDC 669.018.29:539.4.001.5

A STUDY OF THE STRENGTH PROPERTIES OF THE ALLOY AT6 AND VT6S AT NORMAL AND ELEVATED TEMPERATURES

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 2, Feb 78 pp 5-7

DANILOV, M. V., PRITYKINA, L. S., KUTEPOV, S. M., KOSAREV, A. I. and NEIMAN, S. M.

[Abstract] Studies of AT6 and VT6S were performed at the Scientific Research Institute of Chemical Machine Building. The alloys were tested for short- and long-term strength at normal and elevated temperatures. Five melts of each alloy were studied. Specimens were cut from sheets of varying thickness. AT6 was studied both with and without heat treatment (annealing at 800-850 C, holding for 30-40 minutes, cooling in air); VT6S was also tested with and without heat treatment (annealing at 800 C, holding 1 hr, cooling in air, or hardening from 880 C, holding for 1 hr, cooling in water + aging at 500 C, holding 4 hrs). The long-term strength of both alloys were found to vary widely from specimen to specimen, particularly with test times of over 1000 hrs. Figure 1; tables 3.

USSR

UDC 621.646.5:531.41.001.5

THE USE OF 20KhGSL AND 20Kh STEELS FOR THE MANUFACTURE OF WELDED STRUCTURES
FOR USE IN COLD CLIMATE REGIONS

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 2,
pp 24-25

NAPETVARIDZE, Z. G., KAKHRAMANOV, KH. T., SANADZE, M. L. and BOGOPOL'SKIY,
R. M.

[Abstract] The Azov Institute for Petroleum Machine Building has studied the possibility of using series-manufactured apparatus of 20KhGSL and 20Kh steels in cold climate regions. The studies indicate that welded joints between 20Kh and 20KhGSL steel are suitable for use in equipment to be used in cold climate regions only if the metal to be welded is preheated before welding, then heat treated (hardened and high-tempered) after welding. Figures 7; tables 2; references 3 (Russian).

USSR

UDC 621.981.073

LOW-CYCLE FATIGUE RESISTANCE OF WELDED JOINTS IN HEAT TREATED TYPE 10G2FR
STEEL

Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 2,
Feb 78 pp 27-29

KOSHELEV, N. N., KHAKIMOV, A. N., YEFIMENKO, L. A., KRUTOV, A. N. and
MIT'KIN, V. N.

[Abstract] A study is presented of the low-cycle strength of welded joints in thermally hardened type 10G2FR steel, made by electroslag welded joints made by electroslag welding using the normal technology and the fatigue durability of the base metal, thermally hardened low-alloy 10G2FR steel 40mm thick, were also studied for comparison. The tests were performed on prismatic specimens with a single notch on one side producing a stress concentration factor of 2.5. It is found that optimization of the cooling rate of the metal of the seam and the surrounding zone during electroslag welding of this steel can reduce cyclical plastic deformation and increase the low-cycle fatigue strength of welded joints. References 3 (Russian).

TYPE 08Kh16N9M2 STEEL FOR STEAM SUPERHEATERS OF SUPERCRITICAL POWER UNITS

Moscow TEPLOENERGETIKA in Russian No 3, Mar 78 pp 63-67

FANTAYEVA, M. I., SLEPAK, E. S., L'VOVA, YE. P., ZEITMAN, G. I., CHMELEVA, G. I. and PESOTSKAI, YE. D., Central Scientific Research Institute for Machine Building Technology; Turbine and Boiler Plant

[Abstract] This article presents the results of a study of the quality of metal in steam superheating pipes made of 08Kh16N9M2 steel and of welded joints made by the contact and electric arc methods, as well as information on the behavior of pipes under production conditions in the process of manufacture of experimental sections of a high-pressure convective steam superheater. The data produced on the long-term strength and ductility of the metal, as well as the high level of short-term mechanical properties both immediately after strain hardening and after long-term aging at the usage temperature, indicate that cold bent pipe can be used in superheaters without heat treatment of this steel. Steam superheaters of austenitic chrome-nickel-molybdenum pipe manufactured abroad is now in use at the Novocherkassk, Krivorog, and other electric power plants, and has been in use for over 50,000 hrs. This indicates that type 08Kh16N9M2 steel can be recommended for extensive industrial use in the steam superheaters of supercritical parameter power units. Figures 4; tables 3.

ROMANIA

INFLUENCE OF THIOCYANIDE TREATMENT ON THE WEAR RESISTANCE OF HIGH-SPEED STEEL TOOLS

CONSTRUCTIA DE MASINI in Romanian Vol 29, No 5, 1977 pp 222-226

GIACOMELLI, I., engineer, University, Brasov; DRUGA, L., engineer, I.P.T.T.S.C. Bucharest

[Abstract] Three types of high-speed steel, Nos. Rp 3, Rp 5 and Rp 9, were subjected to heat treatments (austenization and annealing), followed by exposure to two different baths of sodium thiocynide at 560°C for periods from 0.5 to 2 hours. The results revealed that the thermochemical treatment results in a significant increase of the wear resistance during cutting operations. This is due to the creation between the surfaces of a carbonitride and sulfide layer which reduces the friction between the surface in contact. The properties of the diffusion layer are directly affected by the composition of the bath and the duration of soaking.

YUGOSLAVIA

UDC 553.492.1:662.349.2(497.115=861)

KOSOVO BAUXITES AND THEIR SPECIFIC FEATURES FOR EXPLOITATION

Belgrade TEHNIKA in Serbo-Croatian No 2, 1978 pp 219-224

SHABANI, BAJRAM, Graduate Engineer at the Klina Bauxite Mine

[Abstract] A general summary of the conditions and features of the bauxite deposits found in Kosovo is presented. The ore is low in SiO₂, and varies from layer to layer in the deposits, thus requiring mixing of ore prior to processing. The geographic location and the specific importance of the deposits for the economy of the Kosovo area is stressed, and the content and potential of rare earth metals uranium, thorium, nickel and cobalt is pointed out. Practical methodology for obtaining the ore using common loading techniques, and for regarding the area after extraction, is presented. Figures 7; references 5: 3 Serbo-Croatian, 2 Albanian.

USSR

UDC 621.373.826.004.14:621.317.7

CIRCULAR GAS LASERS IN MEASUREMENT ENGINEERING

Moscow METROLOGIYA in Russian No 3, Mar 78 pp 26-32

LUK'YANOV, D. P., MOCHALOV, A. V., and PRIVALOV, V. YE.

[Abstract] The operation of circular gas lasers when measuring angles and angular velocities, flow velocity and flow rate, length, taking magnetic measurements and used as the basis for a standard frequency measure is discussed. The problem of controlling additive errors is discussed from the point of view of creating a highly stable, compensating substrate for the laser. Periodic reversing of the axis of sensitivity is used to reduce the additive component of the error. A block diagram of a complex system for stabilizing the parameters of the annular gas laser in which the assignment of the search excitation with respect to detuning, the analysis of the amplitudes of the three first harmonics of the variable component signal coming from the photoreceiver and the generation of the detuning, mismatch angle and current control systems are automated.

USSR

UDC 620.179.16

A METHOD OF MEASURING THE AMPLITUDE OF ACOUSTIC EMISSION SIGNALS AND A DEVICE FOR REALIZING THIS METHOD

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI in Russian No 17, 1978 p 141

[Description of Author's Certificate No 606129 Division G, filed 10 Feb 75, published 5 May 78]

KONSTANTINOV, V. A., MASLOV, B. YA., DENISOV, V. V. and KHOL'KIN, O. I.

[Text] This Author's Certificate introduces: 1. A method of measuring the amplitude of acoustic emission signals that involves reception of the acoustic signals, resonant conversion to analog electric signals, amplification and measurement of the amplitude of the electric signals. As a distinguishing feature, the dynamic measurement range is extended by converting the analog signal to a series of pulses with number proportional to the amplitude of the acoustic emission signal, and by counting the number of pulses in the series and computing the amplitude. 2. A device for realizing the method covered in point 1 that contains a resonant electroacoustic transducer, an amplifier, a threshold module, a pulse counter, a digital-analog converter and a registration unit all connected

in series. As a distinguishing feature of this device, a delay line is added with the output connected to the input of the pulse counter, and an amplitude detector is also added with the input connected to the output of the threshold module, while the output of the amplitude detector is connected to the inputs of the delay line and digital-analog converter.

USSR

A PROCEDURE FOR ANALYZING INCOMPLETE BREAKDOWNS OF ELECTRIC CIRCUIT
INSULATION

Moscow OTKRYTIAY, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI,
No 10, 1978 Author's Certificate No 597996

KAGANOV, Z. T., KALASHNIKOV, N. A., LUKMANOV, V. S., PROTSENKO, V. F.,
Ufa Aviation Institute

[Text] A procedure for analyzing incomplete breakdowns of electric circuit insulation based on supplying a high voltage to the tested circuit and measuring the derivatives of the current buildup through the insulation and the voltage drop at the input of the tested circuit on breakdown is disclosed. It is distinguished by the fact that in order to determine the nature of the incomplete breakdown, the derivatives of the current and voltage are separated with respect to their magnitude and for small values of the derivatives of the signals, the information about a thermal breakdown is formulated, and for large values of the derivatives of the signals, information about an electric breakdown.

USSR

UDC 534.232.46-8:621.315.434

ERRORS OF AN ULTRA-ACOUSTIC TIME-COORDINATE CONVERTER OF GRAPHICAL INFORMATION

Moscow METROLOGIYA in Russian No 3, Mar 78 pp 5-16

KZHAGUPOV, R. G., YAKUBOV, R. A., ALIYEVA, L. G. and LYAPIN, YE. A.

[Abstract] The operation of an ultra-acoustic graphical information converter of the time-coordinate type is analyzed, and the problems connected with measurement errors when using the converter are discussed. Equations are derived for estimating these errors. A definite cyclic nature is observed in the variations of the measurement errors which is explained by a decrease in the corresponding normal to the plane of the elastic wave front participating in the excitation of the electromechanical resonance in the piezoreceiver with an increase in the angle between the normal to the plane of the plotting board at the scanning point and the axis of the piezoreceiver. In addition to the basic errors in the converter, the instability of the parameters of the electronic circuitry is also considered. The total error is described by an expression which takes into account the random nature of the errors and the absence of correlation between them. Means of decreasing the error are noted.

USSR

UDC 620.179.152

CALCULATION OF THE SENSITIVITY AND THE SCALE FACTORS FOR RADIOISOTOPIC MEASURING INSTRUMENTS

Sverdlovsk DEFEKTOSKOPIYA in Russian No 2, Feb 78 pp 25-28 manuscript received 7 Apr 77

SEREBRENNIKOV, I. YA.

[Abstract] Sensitivity and accuracy of any instrument are coupled to one another, while sensitivity and reliability are contradictory characteristics. The sensitivity, i.e., ratio of change in the output quantity (voltage) to change in the input (measured) quantity as the latter change becomes infinite-simally small depends on the method of measurement and, moreover, is defined in statistical terms. Radioisotopic instruments have inherently nonlinear statistical characteristics, owing to interaction between isotopic substance and nuclear radiation. The sensitivity of such an instrument is defined here accordingly and calculated, with the output quantity as a function of the input quantity represented in the form of a power

series which thus also represents the scale equation. This concept is applied to the specific case of a gamma-absorption caliper or defectoscope operating on the basis of an exponential-decay relation. The nonlinearity factor for the extrapolated linearized range of measurements is determined in terms of instrument constant, electrical circuit parameters, and gamma-radiation attenuation. The nonlinearity factor is found to be proportional to the width of this range squared and thus a definite relation has been established between sensitivity and scale factors. Figures 1; references 2 (Russian).

USSR

UDC 620.179.14

CORRECTING THE ERROR OF A PHASE-TYPE EDDY-CURRENT CALIPER

Sverdlovsk DEFEKTOSKOPIYA in Russian No 2, Feb 78 pp 58-62 manuscript received after revision 25 Apr 77

BUROV, V. N., DMITRIYEV, YU. S. and SHATERNIKOV, V. YE., Kuybyshev Aviation Institute imeni academician S. P. Korolev

[Abstract] Correcting the edge-effect error of a phase-type eddy-current caliper for measuring the thickness of intricately shaped product samples is found possible by supplementary measurements: with the transducer placed over an electrically conducting nonferromagnetic object of symmetric shape such as a sphere, and with the transducer placed over an asymmetric object near the edge. The problem in the first of these measurements is to determine the real conversion function of the instrument giving a voltage phase reading, which is done with the aid of an auxiliary instrument giving a voltage magnitude reading and with two respective inverting transducers incorporated in a computer. The problem in the second of these measurements is to correct the readings (voltage phase) of the main instrument, which is done with the same equipment connected into an automatic error correcting system. Both instruments receive their input signals from the same measuring coil of a transformer-type eddy-current transducer which is energized from a constant-frequency oscillator, the latter also energizing the auxiliary instrument in the first measurement and both instruments in the second measurement. An experimental inspection of aluminum sheets 0.8 to 3.5 mm thick with this setup indicates that the distance from the sample edge does not affect the accuracy of the thus self-correcting instrument beyond a $\pm 5\%$ error, which is $1/8$ to $1/10$ that without correction. Figures 5; references 4: 3 Russian, 1 German.

USSR

UDC [621.313.322-81:538.311+621.313.322-81:536.5].001.5

ELECTROMAGNETIC AND TEMPERATURE FIELDS IN THE ROTOR OF A TVV-1200-2 TURBO-GENERATOR DURING ASYMMETRIC OPERATING MODES

Moscow ELEKTROTEKHNIKA in Russian No 5, May 78 pp 15-18

VAZHNOV, A. I. (deceased), doctor of technical sciences, professor,
DROZDOVA, L. A., candidate in technical sciences, IVANOV, YU. YA., engineer,
MAKAROVA, L. V., engineer, POPOV, V. V., candidate in technical sciences,
SUKHANOV, V. V., engineer, KHUTORETSKIY, G. M., candidate in technical
sciences, CHERNYSHEV, N. N., candidate in technical sciences

[Abstract] A method of analyzing the electromagnetic field and the temperature field in a turbogenerator rotor has been developed jointly by the Chair of Electrical Machinery at the Leningrad Polytechnic Institute imeni M. I. Kalinin and the Turbogenerator Department of the "Elektrosila" Scientific Research Institute. In order to avoid solving the boundary-value problem of two interacting fields under asymmetric operating conditions, each field is treated separately and their interaction is approximately accounted for by an already known method. Calculations were made for the rotor of a TVV-1200-2 turbogenerator, by combining the equations of field theory with those of circuit theory. The rotor was divided into zones, with axial and tangential eddy currents in the embedded-conductor zone and in the end-winding zone. The simulation was based on "straight" rather than curving stator and rotor surfaces, a smooth inside stator surface carrying an infinitesimally thin current sheet, an infinitely high magnetic permeability of the stator steel core, a constant magnetic permeability of the rotor iron core (at one level under low saturation and at another level under high saturation), solid rotor slot wedges, and uniform spacing of rotor slots around the periphery. The effects of banding and excitation winding were also taken into account on the basis of simplifying assumptions. The thus obtained distribution curves of losses over the tooth depth and the banding depth, together with the heating (temperature-time) curves for various critical sections, indicate that the temperature of all massive rotor components reaches much lower levels under prolonged asymmetric conditions ($I_2=0.08I_n$) than under normal operating conditions. Thus the temperature of 130°C-rated insulation reaches only 71°C. On the basis of the i^2t -criterion, asymmetric conditions with I_2 closer to I_n must be more severely limited in duration. Figures 4; tables 1; references 8: 7 Russian, 1 Western.

USSR

UDC 621.3.019:519.2

UPPER BOUND FOR THE NUMBER OF STATISTICAL TESTS IN THE APPROXIMATE
SOLUTION OF THE PROBLEM OF OPTIMAL REDUNDANCY

Moscow NADEZHNOT' I KONTROL' KACHESTVA No 2, 1978 pp 16-21 manuscript
received 18 Oct 77

GORDIYENKO, YE. I.

[Abstract] The necessary inequalities are derived which permit determination of the upper bound for the number of statistical tests in the approximate solution of the problem of optimal redundancy with given precision when the lifetime of the elements is not known in advance and with given reliability indexes of the devices. In deriving the given expressions the Chebyshev version of the inequality is used, and a series connected system in the sense of reliability made up of N devices of different types are considered. It is assumed that the lifetime of the jth type device has exponential distribution, and the devices have independent failures.

USSR

UDC 546.5:543.425

ATOMIC ABSORPTION DETERMINATION OF GOLD IN PROCESS SOLUTIONS OF COMPLEX
COMPOSITION

Moscow ZAVODSKAYA LABORATORIYA in Russian No 4, 1978 pp 420-422 manuscript
received 13 Oct 76

MALYKH, V. D., PLYASKINA, D. P., YERKOVICH, G. YE., Irkutsk State Scientific
Research Institute for Rare and Nonferrous Metals

[Abstract] Atomic absorption determination of gold was performed on a Perkin-Elmer 303 spectrometer. Sulphate solutions of thiourea containing iron sulphate, salts of manganese and other elements, as well as sulphide-alkaline solutions containing significant quantities of NaOH and Na₂S, were analyzed. It was found that two measurements were sufficient to determine the concentration of gold in a solution, excluding the influence of other elements. Figures 2; tables 2; references 5: 4 Russian, 1 Western.

USSR

UDC 546.5:553.41:543.42.062

METHOD OF DIRECT SPECTRAL DETERMINATION OF GOLD IN GEOLOGICAL SPECIMENS

Moscow ZAVODSKAYA LABORATORIYA in Russian No 4, 1978 pp 423-426 manuscript received 13 Oct 76

PROKOPCHUK, S. I., RAYKHBAUM, YA. D., STUDENNIKOVA, T. G., Institute of Geochemistry, Siberian Department, Academy of Sciences, USSR, Irkutsk

[Abstract] The scintillation method of spectral analysis, based on the recording of individual bursts of lines of an element as a powdered specimen is introduced to a flame or plasma, was used to determine gold in geological specimens in the concentration interval 0.02-50g/t. The work was performed on an STE-1 spectral instrument, with the radiation recorded by two FEU-39A photomultipliers, the signals from which were fed to the input of a differential amplifier. The method provides the required accuracy with two parallel determinations when there is at least 0.1g/t of gold present. With lower contents of gold, 0.05-0.1g/t, the number of parallel determinations should be increased. The method and calibration graph require further development and refinement, and particle size, the form in which the gold is present in the specimen and the chemical composition of the specimen are important factors in the determination. Figures 2; tables 3; references 10 (Russian).

USSR

UDC 539.23.082.5

MEASUREMENT OF OPTICAL CONSTANTS AND THICKNESSES OF ELECTRICALLY CONDUCTIVE FILMS ON TRANSPARENT CERAMIC

Moscow ZAVODSKAYA LABORATORIYA in Russian No 4, 1978 pp 445-446 manuscript received 9 Mar 77

VIDRO, G. I., MUKHINA, YE. G., SMIRNOVA, YE. I., MOROZOVA, I. A.

[Abstract] An ellipsometric method is described for determination of the index of refraction and thickness of thin, electrically conducting films on a transparent ceramic. The equations presented yield the variation in the ellipsometric parameters Δ and ψ with the three film parameters n_2 , k_2 and d_2 . This work presents measured data from films of indium dioxide with coefficient of extinction $k_2 \approx 0.01$. It was found that the index of refraction of the ceramic studied varied from 2.45 to 2.55 (at 0.63 μ m). The ellipsometric parameters ψ and Δ were calculated using the formulas presented in this article with a computer. The results were used to construct a nomogram, each curve of which corresponds to an index of refraction. Figure 1; references 5 (Russian).

CZECHOSLOVAKIA

VERIFICATION OF LINE DISTANCE STANDARDS OF THE CZECHOSLOVAK METROLOGICAL INSTITUTE

Prague JEMNA MECHANIKA A OPTIKA in Slovak Vol 23, No 1, Jan 78 pp 15-17

NAVRATIL, Vlastimil; Czechoslovak Metrological Institute, Bratislava

[Abstract] The length comparative instrument CLC-20 produced by the Societe d'Instruments de Physique at Geneva Switzerland was used to study two line standards. So that the line length standard could be compared directly to wave lengths of laser radiation the CLC-20 instrument was combined with a laser-interferometer LA 3000 manufactured by the Czechoslovak firm Metra, National Enterprise, Blansko. For highest accuracy the two combined instruments are controlled automatically and the microscope movements are set at one millimeter each. After an advance of one millimeter the values determined by the photoelectrical microscope and by the laser-interferometer are recorded. The values obtained by the combined CLC-20 and the laser-interferometer instrument were compared to Standards prepared at the Bureau International des Poids et Mesures of Paris, using 10 centimeter lengths. Seventy percent of the results agreed within 0 and 0.3 micrometers, 20 percent within 0.3 and 0.6 micrometers, and 10 percent within 0.6 and 1.4 micrometers. Even better agreements are expected in the future. Figures 7, no references.

USSR

UDC 624.131+539.215

DETERMINATION OF THE AMOUNT OF EARTH THROWN OUT UPON EXPLOSION OF A BURIED CORD CHARGE IN A 2-LAYER MEDIUM

Novosibirsk ZHURNAL PRIKLADNOY MEKHANIKI I TEKHNICHESKOY FIZIKI in Russian No 2, Mar-Apr 78 pp 109-114 manuscript received 21 Mar 77

IL'INSKIY, N. B., POTASHEV, A. V.

[Abstract] The ground in which the charge is buried is assumed to consist of two layers of identical density but with different critical speed. The problem is solved for both possible versions, with the greater critical speed in the upper and in the lower layers. Where v_1 (upper layer) is less than v_2 (lower layer), a section is clearly traced which follows the line of separation of the media; in the opposite case, this section is less clearly seen. As the strength of the soil decreases, with identical charge placement, the pit produced becomes both wider and deeper. The width increase is determined by the lower layer in this case. With identical critical speeds, pit dimensions increase with increasing depth of charge placement. Figures 6; references 4 (Russian).

USSR

UDC (549:535.2):549.514.51

EFFECTIVENESS OF ALPHA AND GAMMA RAYS IN THE FORMATION AND THE REDUCTION OF E_1' -CENTERS IN QUARTZ

Moscow ATOMNAYA ENERGIYA in Russian Vol 44, No 2, Feb 78 pp 180-181 manuscript received 27 Jan 77

RAKOV, L. T. and MOISEYEV, B. M.

[Abstract] Quartz is used for paleodosimetry in search of uranium deposits. The amount of natural radiation is estimated from the concentration of E_1' -centers in the quartz, such a defect center constituting an electron trapped in an oxygen vacancy and, if caused by irradiation alone, capable of existing here for millions of years. An experimental study was made to determine the relative effectiveness of alpha and gamma quanta in the formation and the reduction of such centers. In the first part the concentration of these centers was measured by the electron-paramagnetic-resonance method, in originally center-free natural polycrystalline quartz specimens after irradiation from an artificial Pu^{238} or Co^{60} source respectively. In the second part quartz specimens with known concentrations of E_1' -centers were heated to 450-550°C and then irradiated. According to the results, $8 \cdot 10^{14}$ and only $1 \cdot 10^{14}$ electron spins/g are generated in cold quartz by irradiation with $20 \cdot 10^7$ rads of alpha or gamma quanta respectively. On the other hand, the reduction of E_1' -centers in hot quartz is completed by irradiation with 10^7 - $5 \cdot 10^7$ rads of alpha quanta and with only 10^5 - 10^6 rads of gamma quanta. Figures 2; references 7 (Russian).

ROMANIA

DETERMINATION OF THE THICKNESS OF MINE SHAFT SUPPORTS, TAKING INTO ACCOUNT THE INTERACTION BETWEEN SUPPORT AND SURROUNDING ROCKS

Bucharest MINE, PETROL SI GAZE in Romanian Vol 28, No 6, 1977 pp 261-266

HIRIAN, C., Dr Engineer, Mining Institute, Petrosani

[Abstract] A method was developed for determining the required thickness of monolithic mine shaft supports for various depths in the Valea Jiului coal basin. The most often encountered compressive breaking strength values of the rocks were found to lie between 100 and 700 kgf/m². In situ measurements at a depth of 350 m yielded maximum values of 36 tf/m² for schistose clays. The calculations indicated that for depths ranging from 300 to 350 m in clayey rocks with compressive strengths below 100 kgf/m², a thickness of 30 cm may be acceptable for a single-layer concrete support; at depths up to 500 m a thickness of 45 to 50 cm is required. Because of the shifting of the rock and the interaction between the rock and the support at depth exceeding 600 m a two-layer support, consisting of an elastic and a rigid layer must be used. The new method helps to reduce the construction costs considerably.

USSR

UDC 621.472

OPTIMIZATION OF ELECTRICAL AND OPTICAL CHARACTERISTICS OF SILICON PHOTO-ELEMENTS DESIGNED FOR PHOTOTHERMAL CONVERTERS OF CONCENTRATED SOLAR RADIATION

Tashkent GELIOTEKHNICA in Russian No 1, 1978 pp 3-12 manuscript received 3 Mar 77

KOLTUN, M. M., GAVRILOVA, I. P., All-Union Order of the Labor Red Banner Scientific Research Institute of Current Sources

[Abstract] A study was made of means of optimizing the electrical and optical characteristics of silicon photoelements for operation at increased concentrations of solar radiation in photothermal converters. The spreading resistance of the alloyed layer determines the efficiency of the silicon photoelements. Data are presented from studies of the influence of the thickness of this layer, the configuration of the contact grid, the transmitting coatings and metal layers on the efficiency of the Si elements at various concentrations. Measurements indicated that for 30 to 70-fold concentration the efficiency reaches approximately 12 percent. The theoretical and experimental data indicate that two types of planar silicon photoelements can be used for photothermal units--with ordinary transmitting coating and with selective black and white coating. The former have higher electrical characteristics and the latter, better optical properties. Both can be used depending on the operating conditions of the required photoelements.

USSR

UDC 621.427

GENERAL PRINCIPLES OF CALCULATING MULTIELEMENT CONCENTRATING SYSTEMS

Tashkent GELIOTEKHNICA in Russian No 1, 1978 pp 22-29 manuscript received 22 May 76

ZAKHIDOV, R. A., Central Planning-Design and Technological Process Office of Scientific Instrument Making, Academy of Sciences, Uzbek SSR

[Abstract] The general principles of the design of multielement concentrating systems are discussed in terms of the fundamental concepts of the radiant vector fields, statistical brightness, reflection and beam path. The outline and block diagram of an algorithm for the mechanical design of the discussed systems, including multimirror, multifaceted, polyheliostatic, and so on, are analyzed, and the equations are derived for the calculation of the parameters of these systems.

OPTIMAL EQUALIZATION OF THE CONTACT PRESSURES OF BEAMS AND SLABS IN A
LAYER OF FINITE THICKNESS UNDER THE EFFECT OF REPEATED LOADS

Minsk DOKLADY AN BSSR in Russian Vol 22, No 3, Mar 78 pp 251-254 manuscript
received 17 Oct 77

ALYAVDIN, P. V., Belorussian Polytechnical Institute

[Abstract] A precise formulation is presented for the problem of the total involvement of the foundation in joint operation with a structure in the presence of multiparametric repeated loads as the minimax problem of optimal control of a system with distributed parameters. The differential, integro-differential or functional equations may be used to describe the controlled systems. By successive analysis of the auxiliary optimization problem for the structure and the nonoptimization problem for the structure and the foundation an acceptable solution is found to the formulated problem in the first iterations. A nonlinear elastic or elastic plastic beam or slab transmitting a given pressure to a layer of finite thickness under repeated load is used as an example. In this case the foundation is in the form of an elastic isotropic layer of finite thickness, and the slab operates in the layer with plane deformation. Only the vertical pressure is transmitted to the foundation from the structure, and this pressure is regulated by varying the pliability of the system or the inverse cylindrical rigidity of the slab or beam. The relaxation method of coordinate-by-coordinate descent is used to solve the problem of minimization of a convex function with trivial restrictions on nonnegative variables.

USSR

UDC 532.232.2

PHOTOGRAPHIC EXAMINATION OF A JET FROM A HYDRAULIC GUN

Minsk IZV. VUZ, ENERGETIKA in Russian No 4, Apr 78 pp 143-146 manuscript received 11 Apr 77

UKRAINSKIY, YU. D., Chair of Physical Hydrodynamics, Donetsk State University

[Abstract] The characteristics of a jet from a hydraulic gun were studied by the method of direct shadow photography with a superfast photorecorder in the slow-motion mode. An IFK 2000 lamp served as the light source, energized from a capacitor through a seven-stage staircase network ($125 \mu\text{F}$ and 3 mH in each stage) so as to produce rectangular flashes of 2 ms duration and placed inside a reflector of matte glass so as to produce a uniform background illumination. A jet was produced by shock action, namely by suddenly opening the valve from the compressed-air compartment inside the gun. This method was found to be very effective for studying such jets and their interaction with ambient air. The discharge of such a jet was, furthermore, found to be unsteady, its velocity reaching 670 m/s at 40 diameters past the nozzle throat and then decreasing till the jet breaks up. Figures 4; references 2: 1 Russian, 1 Western.

USSR

UDC 528.517:621.378.9

SIGNAL-TO-NOISE RATIO IN A PULSE-PHASE OPTICAL RANGE FINDER

Leningrad IZV. VUZ, PRIBOROSTROYENIYE in Russian Vol 20, No 5, Nov-Dec 77 pp 109-112 manuscript received 23 Sep 76

TAUKCHI, V. M., Leningrad Institute of Precision Mechanics and Optics

[Abstract] In a modern optical range finder the light pulses coming from the target and impinging on the photocathode of the photoelectron multiplier are converted to electric pulses. Their amplitude is then modulated by harmonic high-frequency oscillations, and subsequent demodulation in the first detector yields the low-frequency envelope with information about the target's distance. The performance of such a range finder depends largely on the signal-to-noise ratio at the output of the envelope detector. In this analysis the noise at the photocathode is treated as a stationary random process with zero mean value and with a constant energy spectrum. Its statistical characteristics are calculated, with the detector assumed to consist of a noninertial nonlinear element and a low-pass smoothing

filter with a sufficiently large time constant. The analysis reveals that such a range finder performs better with large signals and correspondingly high levels of noise from the target than it does with small signals from the target. References 3 (Russian).

USSR

UDC 771.351.7:535.317.68

CALCULATION OF COMPONENTS OF APOCHROMATS OF FOUR TYPES OF GLASS FOR A BROAD SPECTRAL RANGE

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 78
pp 17-21 manuscript received 3 Feb 77

SHPYAKIN, M. G.

[Abstract] A method is suggested for selection of glasses and design of components for strict correction of chromatisms for four wavelengths for individual lens elements. It is demonstrated that components of four types of glass assure strict correction of chromatism for the four wavelengths and, therefore, practically throughout the broad interval of wavelengths from 400 to 1000 nm. It is particularly important that low powers can be achieved for the individual elements. For components with fluorite in 4-element combinations, the power of the element can be less than 2, that is less than in ordinary achromats. The apochromatic component is equivalent in image quality in the assigned spectral range to a pure mirror system. Figures 3; tables 4; references 4: 2 Russian, 2 Western.

ANALYSIS OF THE INTERCONNECTION OF THE STAGES OF PRODUCTION AND RECORDING OF EVAPOROGRAPHIC IMAGES

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 78
pp 11-14 manuscript received 22 Apr 77

POPOVA, K. B.

[Abstract] The various stages in production and recording of an evaporographic image and some of the characteristics of such an image have been studied in detail. However, the final image is the result of a number of processes and depends on many factors. The author has therefore composed a consistent system of graphs which represents the influence of various factors on the successive stages of production and recording of evaporographic images. The interrelationship of the stages can be traced only qualitatively, since it is impossible to assure and measure constancy of the heat field on the membrane, or the state and composition of the oil vapors in the cuvette of the evaporograph. Photographic recording of the evaporographic image allows more precise determination of the difference between the radiation of the object and the background radiation than does visual observation. Figures 3; references 11: 5 Russian, 6 Western.

EAST GERMANY

NOTES ON THE DETERMINATION OF THE IMAGE PLANE OF THE MAXIMUM DEFINITION
BRIGHTNESS (STREHL INTENSITY RATIO)

East Berlin FEINGERAETETECHNIK in German Vol 27, No 2, Feb 78 pp 57-60

HOFMANN, C., lecturer, Ph. D., Carl Zeiss State Enterprise, Jena

[Abstract] A review of the literature dealing with the determination of the image plane of the maximum definition brightness repeatedly shows that the determination is made on the basis of the disappearance of the mean wave aberration. However, it was demonstrated that this is not always a proper basis. As a matter of fact, in many instances it is not only not a sufficient condition but also not a necessary condition. Theoretical assessment of the disappearance of the mean wave aberration, the disappearance of the variation of the square mean of the wave aberration, and the determination method of the maximum definition brightness indicated that another general condition, which was shown to be both sufficient and necessary, exists. It was derived and described. It is based in the disappearance of the differential quotient of the wave aberration, which is correlated with the disappearance of the defocusing coefficient. Figures 3; references 7: 4 German, 3 Western.

USSR

UDC 539.30+620.171.5

STRESS CONCENTRATION NEAR THE TIP OF A CRACK ACCORDING TO THE MOMENT THEORY OF ELASTICITY, USING THE METHOD OF PHOTOELASTICITY

Novosibirsk ZHURNAL PRIKLADNOY MEKHANIKI I TEKHNICHESKOY FIZIKI in Russian No 2, Mar-Apr 78 pp 150-154 manuscript received 15 Feb 77

SHIRYAYEV, YA. M.

[Abstract] A study is made of the concentration of stresses near the tip of a crack in a transverse field of simple extension. The influence of moment stresses on stress concentration near the crack is studied both analytically and by the experimental method of photoelasticity. The experimental study leads to the construction of an equation in dimensionless form for the stress intensity factor as a function of the half length of the crack. Analysis of the experimental curve indicates that the stress intensity factor decreases with a decrease in crack length, but the change is not proportional to the square root of crack length as would follow from the classical theory. Figures 3; references 9: 3 Russian, 6 Western.

USSR

UDC 531.36

SUFFICIENT CONDITION FOR STABILITY OF AN AXISYMMETRIC SPINNING TOP FILLED WITH LIQUID

Kiev MEKHANIKA TVERDOGO TELA (Collection of Articles) in Russian No 9, Sep 77 pp 82-86 manuscript received 8 Nov 75

IGNAT'YEV, A. O., Institute of Applied Mathematics and Mechanics, Academy of Sciences Ukrainian SSR

[Abstract] Under consideration is a heavy spinning top which has an ellipsoidal cavity completely filled with an ideal liquid. The object of the analysis is to determine and construct the region where the sufficient condition for stability of uniform rotation of this top about its vertical axis of symmetry, with simultaneous vortical motion of the liquid inside, is satisfied. For this purpose, this sufficient condition is transformed to a parametric inequality and the stability boundaries then plotted in the (Ω, ω) -plane (Ω denoting the angular velocity of the top shell and ω denoting the angular velocity of the liquid). Figures 3; references 2 (Russian).

USSR

UDC 624.014.2

LOW-CYCLE FATIGUE OF STRUCTURAL STEEL WELDS ON THE STAGE OF CRACK
ORIGINATION AND PROPAGATION UNDER BIAXIAL BENDING

Kiev PROBLEMY PROCHNOSTI in Russian No 2(104), Feb 78 pp 16-20 manuscript
received 26 Apr 77

VINKLER, O. N., POLEZHAYEV, B. P. and TARASOV, V. M., TsNIPiroyektstal'-
konstruktsiya, Moscow

[Abstract] The paper gives the results of a study of low-cycle fatigue of welds made in low-alloy steel grades 10KhSND and 16G2AF under conditions of biaxial bending. The tests were done in a symmetric strain cycle at a rate of five cycles per minute. The effective coefficients of stress concentration were determined as a function of the loading cycle for three types of butt welds: with and without seam reinforcement and with intersecting seams. It was found that the effective coefficients of stress concentration may be 1.7 times as high as those for axial loading. The rate of growth of fatigue cracks in the weld as a function of the spread of the coefficient of stress intensity is described by a power law. The parameters of this relation found in the given experiment may be used in calculations of the durability of structural elements on the stage of development of fatigue cracks. Figures 4; references 4 (Russian).

USSR

UDC 620.17:178.3

RELATION BETWEEN THE DEPTH AND LENGTH OF A FATIGUE CRACK DEVELOPING IN
CIRCULAR SPECIMENS UNDER BENDING

Kiev PROBLEMY PROCHNOSTI in Russian No 2(104), Feb 78 pp 21-26 manuscript
received 12 Oct 76

KRAMARENKO, O. YU. and KULIKOVSKAYA, O. V., Kiev

[Abstract] An investigation is made of the influence that the following factors have on the relation between the depth and length of fatigue cracks in circular specimens: 1) stress concentration in testing of smooth specimens and those with a rounded notch; 2) structural nonhomogeneity of the material when testing grade 45 steel specimens made from high-strength cast iron with nodular graphite; 3) the kind of loading -- bending with twisting and bending in one plane. It is found that stress concentration reduces the depth of a fatigue crack in circular specimens as compared with its length. This effect is intensified as fatigue fracture develops. The effect of stress concentration shows up more intensively

under conditions of bending in a single plane. Tables are given showing the coefficients for different materials in the correlation equations

$$\lg t = B + b \lg l \quad (1)$$

$$\lg \frac{t}{d} = B' + b \lg \frac{l}{d}, \quad (2)$$

where t is the depth of the crack and l is its length. These equations show the influence of stress concentration on the relation between depth and length of a fatigue crack in circular specimens. Structural nonhomogeneity of high-strength cast iron influences the depth/length ratio of a developing fatigue crack in the same direction as stress concentration, but less strongly. The results of this study can be used to determine the depth of a fatigue crack from measurement of its surface length. Figures 7; references 10: 8 Russian, 2 Western.

USSR

UDC 621.313.322-81.064.1.064.2

TORSIONAL MOMENTS AT THE DRIVE SHAFTS OF TGV-SERIES TURBOGENERATORS DURING CLEARING OF MOMENTARY SHORT CIRCUITS

Moscow ELEKTROTEKHNIKA in Russian No 5, May 78 pp 11-14

AKSENOVA, L. YA., engineer, LIVSHITS, A. L., candidate in technical sciences, RUBISOV, G. V., candidate in technical sciences

[Abstract] A common abnormal condition under which large turbogenerator sets operate occurs when a momentary short circuit behind the transformer is cleared without disconnection of the set from the network. Additional mechanical and electrical transients superpose then on the not yet extinct transients due to such a short circuit. Generator shafts are usually designed with a safety margin of 1.35, to withstand a torsional moment without plastic deformation. Here the maximum electromagnetic torques and torsional moments, as well as the first eight natural frequencies of torsional vibrations were calculated on the basis of nominal operating parameters and machine characteristics. The weakest neck sections of generator shafts on the turbine side and on the exciter side were considered. The data provide useful information for the design and the operation of TGV generators (200, 300, 500 MW; 1500, 3000 rpm) with PVK or K turbines and with STV or BTV exciters. Figures 5; tables 3; references 4: 2 Russian, 2 German.

USSR

UDC 624.073.012.46.7

STRENGTH OF PRESTRESSED MULTIPLE-CAVITY PANELS UNDER TRANSVERSE LOADS

Moscow BETON I ZHELEZOBETON in Russian No 4, Apr 78 pp 28-30

KRAMAR', V. G., ZALESOV, A. S., IL'IN, O. F., Scientific Research Institute for Reinforced Concrete, ZAKHARENKO, YE. I., Near Eastern Scientific Research Institute for Reinforced Concrete, UKELIS, G. S., Orgtekhstroy Trust, Construction Ministry, Lithuanian SSR

[Abstract] In order to refine the methods of design of multiple-cavity panels and to determine the need for their reinforcement, in connection with the possibility of manufacture of these panels by the method of extrusion, experimental and theoretical studies were undertaken. The strength criterion for inclined cross sections of decking with cavities without reinforcement used in this study was the moment of formation of inclined cracks, rather than the loss of load-bearing capacity. It is found that prestressing of the reinforcement increases the load at which inclined cracks are formed and thus the failure load. Experimental loading showed that the first visually observed inclined cracks agree well with the transverse force calculated by an equation presented in this article, considering the form of the cross section and the presence of prestressing in the reinforcement. The results of testing of I-beam fragments, as well as multiple-cavity panels in full scale, confirm the method of strength calculation suggested. In many cases, transverse reinforcement is not required, facilitating extrusion. Figures 3; table 1; references 3 (Russian).

USSR

UDC 531.36

STABILITY REGIONS OF UNIFORM ROTATION OF AN AXISYMMETRIC SPINNING TOP FILLED WITH LIQUID

Kiev MEKHANIKA TVERDOGO TELA (Collection of Articles) in Russian No 9, Sep 77 pp 73-81 manuscript received 2 Dec 74

IGNAT'YEV, A. O., MARGOLIS, S. M. and SAVCHENKO, A. YA., Institute of Applied Mathematics and Mechanics, Academy of Sciences Ukrainian SSR

[Abstract] A heavy spinning top is considered which consists of a hollow solid shell and a liquid filling the cavity. The behavior of the $\phi(\Omega, \omega) = 0$ curve (Ω denoting the angular velocity of the shell and ω denoting the angular velocity of the liquid) in the $\Omega\omega$ -plane is analyzed, this curve

defining the region where the necessary conditions of stability are satisfied. The analysis of this curve is based on the method of its intersections with straight lines $\omega = \Omega$ and analysis of the corresponding parametric equation. Certain properties pertaining to symmetry, slopes, and asymptotes are utilized here and applied specifically to spinning tops in the shape of prolate and oblate ellipsoids. The effect of the vorticity of the liquid on the stability of uniform spinning is also revealed by this analysis. Equal angular velocities of both masses is a special case in which, under certain conditions, a prolate ellipsoid may be unstable at any angular velocity. Figures 4; references 6: 5 Russian, 1 Western.

USSR

UDC 621.165

AN APPROXIMATE METHOD OF ESTIMATING PROFILE DRAG DURING THREE-DIMENSIONAL FLOW ACROSS A TURBINE STAGE

Kiev PROBLEMY MASHINOSTROYENIYA (Collection of Articles) in Russian No 4, 1977 pp 93-97 manuscript received 17 Nov 75

PYASIK, D. N., Khar'kov Turbine Plant imeni S. M. Kirov, SOKOLOVSKIY, G. A., Institute of Problems in Machine Design, Academy of Sciences Ukrainian SSR

[Abstract] The aerodynamic characteristics of nozzle profiles and rotor cascades in a turbine stage are calculated, taking into account the non-cylindrical streamlining of guide vanes and rotor blades as well as an appreciable departure of meridional streamlines from the direction of the turbine axis. The last low-pressure cylinder stages are considered, specifically, where the stream remains confined within approximately a circular cone. The velocity distributions are obtained by conformal mapping into the plane of a complex variable and with proper corrections made for a varying thickness of the boundary layer. Holding the divergence angle of interblade passages within 30° is found to be necessary for preventing excessive energy losses within the peripheral zone. Figures 5; references 5 (Russian).

USSR

UDC 621.165:621.438

DETERMINING THE EFFICIENCY OF A TURBINE STAGE UNDER CUTOFF CONDITIONS

Minsk IZV. VUZ, ENERGETIKA in Russian No 4, Apr 78 pp 52-56 manuscript received 29 Mar 77

GOGOLEV, I. G., candidate in technical sciences, lecturer, KUZ'MICHEV, R. V., candidate in technical sciences, lecturer, KLIMTSOV, A. A., candidate in technical sciences, lecturer, POPKOV, V. I., candidate in technical sciences, lecturer, TARASOV, V. V., engineer, OSIPOV, A. V., engineer, Department of Turbines, Bryansk Institute of Transportation Machinery

[Abstract] The efficiency of a turbine stage under cutoff conditions was evaluated experimentally by three methods, on the basis of the static pressure behind the stage determined as

$$1. \quad p_2 = \frac{1}{2t} \int_0^t (p_2' + p_2'') dt$$

t is the pitch of the nozzle array in the next stage

$$2. \quad p_2 = \frac{1}{t} \int_0^t \int_{r'}^{r''} p_{2i} dr dt$$

p_2' is the static pressure at the blade roots

p_2'' is the static pressure at the blade periphery

r' is the radius of the root section

r'' is the radius of the peripheral section

p_{2i} is the static pressure behind the stage, based on readings across the stream

3. according to the method proposed by academician L. I. Sedov, of averaging the flow parameters over selected cross sections and then calculating the integral characteristics (mass flow rate, energy, and momentum).

Three variants of 2-stage cutoff and one variant of 1 1/2-stage cutoff were considered in this evaluation. All methods yielded results differing by not more than $\pm 0.2\%$. With the distribution of static pressure over the interstage space appearing to be sufficiently uniform, it is recommended that the second method be used as the simplest and fastest one. Figures 3; references 6 (Russian).

USSR

UDC 621.438

TURBINE STAGES WITH RADIAL BLADES

Minsk IZV. VUZ, ENERGETIKA in Russian No 4, Apr 78 pp 57-61 manuscript received 13 Sep 77

YAKOVLEV, V. P., engineer, MITYUSHKIN, YU. I., candidate in technical sciences, lecturer, Chair of Ship Turbines and Appurtenances, Order-of-Lenin Institute of Ship Building, Leningrad

[Abstract] More easily manufacturable radial nozzle and runner blades with backward curving and tangential dip, for minimizing the reaction gradient, have been designed in two versions: 401 with $\tau_{\max}/b_1=0.28$ and 402 with $\tau_{\max}/b_1=0.12$ (τ_{\max} denoting the maximum profile thickness at the median radius and b_1 denoting the blade width at the root). Their aerodynamic performance was analyzed mathematically, on the basis of appropriate equations describing their geometry and with the effect of the expansion ratio taken into account. The results are compared here with those of an experimental evaluation, with conventional type-15 nozzles as references. These results establish the suitability of such blades for high-temperature gas turbines with internal cooling, essentially because of the low mean reaction factor and the small reaction gradient along a runner blade. Figures 3; tables 2; references 7 (Russian).

USSR

UDC 621.438

EXPERIMENTAL STUDY OF A CENTRIFUGAL TURBINE WITH ROTATABLE GUIDE VANES

Minsk IZV. VUZ, ENERGETIKA in Russian No 2, Feb 78 pp 56-61 manuscript received 24 Feb 77

SHERSTYUK, A. N., doctor of technical sciences, professor, DAVYDOV, A. B., candidate in technical sciences, MAGALA, V. A., engineer, Moscow Institute of Chemical Machinery, All-Union Scientific Research Institute of Helium Technology

[Abstract] An experimental study was made of a centrifugal gas turbine with a wide regulation of the effective guide-vane exit angle, by rotating these vanes or by changing their profiles. Five different sets of guide vanes were involved in the test, 23 of them around the disk with a mechanism for rotating all simultaneously and equally. The runner wheel was closed with 20 radial blades, one blade left out of the set. In the first test series air was injected through the guide vanes with a wide exit angle and the theoretical dimensionless exit velocity was varied over a wide range. In the second test series the theoretical dimensionless inlet velocity and the exit angle were varied over wide ranges, with a constant turbine expansion ratio. The results indicate that flat regulation characteristics of such a turbine with the specific power varying over the 0.5-1.0 range can be achieved by appropriately varying the guide-vane exit angle but maintaining it larger than 12° , lest the losses increase prohibitively. An aerodynamic profile of rotatable guide vanes may further improve the efficiency by 1-2%. Figures 4; references 5 (Russian).

USSR

UDC 621.311.22.002.51

SUPPRESSION OF VIBRATIONS OF A TURBINE-PUMP SET IN A 500-MW POWER PLANT UNIT

Moscow ENERGETIK in Russian No 2, Feb 78 p 23

CHEGURKO, L. YE., candidate in technical sciences, VASIL'YEV, V. A., engineer, FOMIN, V. G., engineer, OPRISHCHENKO, B. G., engineer, MAKHORTOV, V. P., engineer, SHMELEV, I. YE., engineer

[Abstract] Each of the two turbine-pump sets in the Troitsk State Regional Electric Power Plant consists of a PN-1000-300 main pump and an OK-18PU drive turbine coupled through a ratchet clutch. The turbine also drives

a PD-1600-180 booster pump through a speed reducer and a ratchet clutch. During startup and adjustment operations of the PTN-A feed pump all bearings in the entire system had been found to vibrate, especially strongly at about 2500 rpm of the feed pump, with displacement amplitudes 3-4 times larger than in the case of a PTN-B feed pump. The frequency of the fundamental vibration mode was found to be 60 Hz, equivalent to the 3600 rpm speed of the turbine runner. Modifications of the mounting supports and of the couplings did not eliminate these vibrations, but proper sealing of the turbine shaft has reduced them to a 3-4 times smaller amplitude and, at the same time, reduced the leakage of lubricating oil into that (hollow) shaft. Figures 1.

USSR

UDC 621.436.001.5:621.43-44

STUDY OF THE OPERATION OF THE 6ChN21/21 DIESEL WITH LOW COMPRESSION RATIO

Leningrad ENERGOMASHINOSTROYENIYE in Russian No 1, 1978 pp 6-7

KOSYAK, A. F., KUZ'MIN, G. S., Central Scientific Research Institute for Diesels

[Abstract] In an attempt to increase the power output of the ChN21/21 diesel, a series of tests were run with reduced compression ratio (8.5:1) and increased, two-stage turbocharging with air cooling after each stage of supercharging. The study showed that a reduction in compression ratio and increase in supercharging allowed the temperature of the charge in the cylinder at the end of the compression cycle to be decreased by 10-15 C at the starting speed of 100-150 rpm. Graphs are presented of the temperature at the end of the compression cycle as a function of crankshaft speed, pressure at the end of the compression cycle as a function of supercharging, and specific fuel consumption as a function of supercharging for the normal operating speed of 1400 rpm. Figures 3.

USSR

UDC 629.113:621.43

TECHNOLOGICAL MEASURES FOR IMPROVEMENT OF THE QUALITY OF PARTS OF THE
ENGINE OF THE "MOSKVICH-412"

Moscow AVTOMOBIL'NAYA PROMYSHLENNOST' in Russian No 4, Apr 78 pp 35-36

SAMOLOV, I. V., Ufa Motor Plant

[Abstract] Several defects have been noted in the parts used in the motor of the Moskvich-412. This article describes some of these defects, such as frequent connecting rod cracking, exhaust valve failure, cylinder sleeve wear, camshaft wear, aluminum block failure, and main bearing wear. In each case, the measures taken to improve the quality of the parts are described, such a heat treatment of connecting rods after cold straightening, use of EP303 steel in place of EI69 steel for the manufacture of exhaust valves, use of low-alloy cast iron for cylinder liners, and replacement of Al-9 aluminum alloy with Al-32 high-strength aluminum alloy for the manufacture of blocks. References 4 (Russian).

USSR

UDC 621.43

SOME EXPERIENCE IN THE USE OF HYDROGEN FUEL FOR A RECIPROCATING ENGINE

Kiev PROBLEMY MASHINOSTROYENIYA (Collection of Articles) in Russian No 4, 1977 pp 81-85 manuscript received 13 Oct 75

PODGORNIY, A. N., VARSHAVSKIY, I. L., MAKAROV, A. A., and MISHCHENKO, A. I.,
Institute of Problems in Machine Design, Academy of Sciences Ukrainian
SSR

[Abstract] There are two major problems associated with the use of conventional hydrocarbon fuels in transportation, namely: limited availability of primary sources, which is further reduced by their diversion to the chemical industry as valuable raw materials, and air pollution by toxic and noxious ingredients of these fuels. One possibility of overcoming these problems would be the use of "pure" hydrogen as fuel, especially since it has a high heat content. Some experience is already available in the use of hydrogen extracted from water in a reciprocating engine. Since 1974 this matter is being studied jointly by the Institute of Problems in Machine Design (Academy of Sciences Ukrainian SSR) and the Khar'kov Automobile and Road Institute. A test model has been developed: a four-cycle single-cylinder (diameter 85 mm, active volume 653 cm³, stroke 115 mm) engine with overhead valves and variable (4-10) compression

ratio, rated speed 900 rpm. Its performance on hydrogen-air mixtures has been found entirely satisfactory and in accordance with the theory of combustion processes. Combustion is completed here with the camshaft at an angle behind the dead center which increases from 13° with 1.3 excess air to 41° with 3.6 excess air. This compares against a 32° angle with a theoretical benzene-air mixture. On hydrogen with 1.3 excess air, moreover, the pressure increases 1.5 times faster than on approximately theoretical benzene-air mixtures corresponding to the maximum combustion rate. Furthermore, no detonation was found to occur with hydrogen-air mixtures at compression ratios up to 10. Combustion of hydrogen without or with little excess air still produces undesirable though small amounts of NO_x exhaust gases, especially at low speeds such as 900 rpm, but above 2.0 excess air there are almost none produced. Figures 4; tables 1; references 9: 7 Russian, 2 Western.

EQUIPMENT

Acoustical & Ultrasonic

USSR

A DEVICE FOR ULTRASONIC TREATMENT

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI, No 10, 1978 Author's Certificate No 597437

BRONIN, F. A., KIRILLOV, YE. I., CHERNOV, A. P., ARTAMOSHKIN, B. S.

[Text] A device for ultrasonic treatment in chemical solutions containing an ultrasonic bath equipped with a drain line and connected to a source of compressed gas by a line with a gas feed check valve built into it is disclosed. It is distinguished by the fact that in order to improve the servicing conditions and raise the level of safety engineering, it is equipped with a chamber inside which an elastic diaphragm is attached which separates the chamber into two sections, one of which is built into the line before the check valve with respect to the gas feed direction, and the other, into the drain line. The diaphragm is placed with the possibility of covering the exit opening of the drain line.

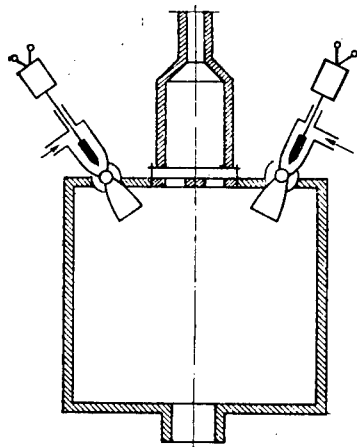
USSR

ACOUSTIC OSCILLATOR

Moscow OTKRYTIYA, IZOBRETENIYE, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI,
No 11, 78 Author's Certificate No 598660

BELYANSKIY, V. S., ORLOV, V. A. and SURMACH, V. F.

[Text] An acoustic oscillator containing a housing made in the form of a channel with a nozzle for creating the basic gas flow, a resonator installed at the channel exit and a nozzle for creating additional jets around the periphery of the basic flow, is distinguished by the fact that in order to obtain the possibility of regulating the oscillation parameters, the nozzles for creating the additional gas jets are made to rotate so that they can be set at different angles to the channel axis, and each one is equipped with a through-cross-section regulator installed with the possibility of displacement along the axis.



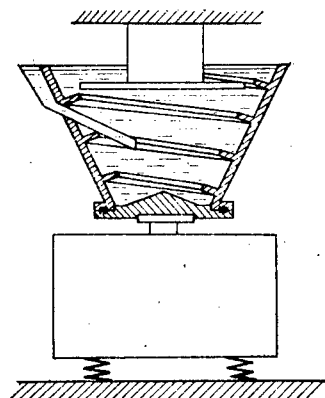
USSR.

DEVICE FOR ULTRASONIC CLEANING OF PARTS

Moscow OTKRYTIYA, IZOBRETENIYE, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI,
No 11, 78 Author's Certificate No 598664

USENKO, N. A. and REVKOV, V. I.

[Text] A device for ultrasonic cleaning of parts, containing a bath in the form of a vibration bin with a spiral trough fastened to the wall of the bath in which an ultrasonic converter with plane radiating surface is located, is distinguished by the fact that in order to improve the quality of cleaning, the ultrasonic converter is placed in the upper part of the bath, and the bath is made in the shape of a truncated cone with the large base up in its axial cross-section, the angle of inclination of the generatrix of which is selected so that the radius of each subsequent turn of the trough will be greater than the radius of the preceding one by at least the width of the trough.



USSR

A PROCEDURE FOR DETERMINING THE SPEED OF ULTRASOUND AND THE DEVICE FOR IMPLEMENTING THIS PROCEDURE

Moscow OTKRYTIYA, IZOBRETENIYE, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI, No 11, 78 Author's Certificate No 599205

KUSHYL, V. M., VASIL'YEV, B. A., BORTSOV, V. L. and KHAMIDYLLIN, V. K., Leningrad Institute of Aviation Instrument Building

[Text] A procedure for determining the speed of ultrasound and the device for implementing this procedure are certificated. 1. A procedure for determining the speed of ultrasound based on excitation of an amplitude-modulated signal in the investigated medium, reception of it at a fixed distance and measurement of the phase shifts of the received signal with respect to the modulating and carrier frequencies is distinguished by the fact that in order to improve the measurement precision, the carrier and modulating frequencies of the amplitude-modulated signal are simultaneously varied proportionally to the zero phase difference with respect to modulating frequency, the phase shift is recorded with respect to the carrier frequency, after which the value of the carrier frequency is varied to the zero phase difference, and the speed of ultrasound is determined by the carrier frequency and by the value obtained for the carrier frequency. 2. A device for implementing the procedure according to item 1 contains a series-connected ultrasonic frequency generator, modulator, measuring acoustic converter, amplifier and first phase detector and also the first amplitude detector connected to the output of the modulator and series connected second amplitude detector and second phase detector and second phase detector connected to the output of the amplifier. The device is distinguished by the fact that it includes a frequency tuning module connected to the input of the ultrasonic frequency generator, a frequency meter and frequency divider, the inputs of which are connected to the outputs of the ultrasonic frequency generator, and the output of the frequency divider is connected to the second input of the modulator, and the commutator, the inputs of which are connected to the outputs of the first and second phase detectors, and the commutator output is connected to the input of the frequency tuning module. The output of the modulator is connected to the second input of the first phase detector, and the output of the first amplitude detector is connected to the second input of the second phase detector.

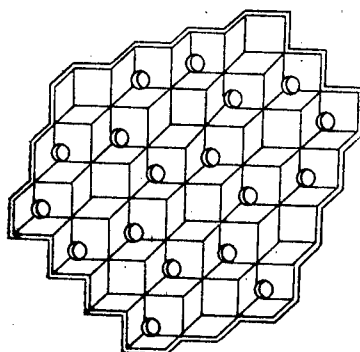
AN ULTRASONIC EMITTER

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
in Russian No 17, 1978 p 22

[Description of Author's Certificate No 605643 Division B, filed 10 Aug 76
published 5 May 78]

GALKOV, V. S.

[Text] This Author's Certificate introduces an ultrasonic emitter that contains a radiating panel on which transducers are placed. As a distinguishing feature of the emitter, the radiating efficiency is increased by making the panel of adjoining cells in the form of corner reflectors with the transducers installed on the corners.



USSR

A BIHARMONIC ANALYZER

Moscow OTKRYTIYA, IZOBRETENIYE, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI,
No 11, 78 Author's Certificate No 599230

LUKASHENOK, A. B., Riga Institute of Civil-Aviation Engineers

[Text] A biharmonic analyzer containing a forced vibration controller, load converter, strain amplifier, attenuator, two pairs of multiplying bridges with photoresistors, each of which is separated from its illuminator by an opaque modulator rigidly connected to the controlling shaft, integrators, an adder and recording circuit is distinguished by the fact that in order to increase the precision, it includes a DC bridge with photoresistors illuminated by the illuminator of the photoresistors of the first pair of multiplying bridges, the output of the indicated bridge is connected to the illuminator of the photoresistors of the second pair of multiplying bridges. The output of its cophasal bridge is connected to an adder, the second input of which is connected to the output of the attenuator.

USSR

A DEVICE FOR REGULATING THE QUANTIZATION LEVEL

Moscow OTKRYTIYA, IZOBRETENIYE, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI,
No 11, 78 Author's Certificate No 599241

DOLGANOV, YU. M., KORNEYEV, YU. A., MAZIN, YU. V. and SEPPENEN, V. V.,
Leningrad Institute of Aviation Instrument Building

[Text] A device for regulating the quantization level according to Author's Certificate No 5357430 is distinguished by the fact that in order to increase the quantization precision, it includes an interpolating filter and auxiliary quantizer. The interpolating filter is connected between the outputs of the shift registers of the memory and the first input of the auxiliary quantizer, the second and third inputs of which are connected to the second and third inputs of the quantizer respectively.

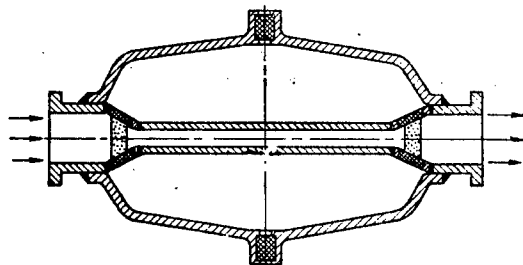
USSR

A PRESSURE FLUCTUATION SUPPRESSOR FOR HYDRAULIC LINES

Moscow OTKRYTIYA, IZOBRETENIYE, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI,
No 11, 78 Author's Certificate No 599137

UDOVICHENKO, S. G., BRUDKOV, L. I., KLIMOV, N. A. and SHORIN, V. P.,
Kuygyshev Aviation Institute

[Text] 1. A pressure fluctuation suppressor for hydraulic lines according to Author's Certificate No 311085 is distinguished by the fact that in order to improve the operating stability by removing air from the bypass channel, elements made of porous material are installed in the housing of the suppressor at the air accumulation point. 2. A suppressor according to item 1 is distinguished by the fact that the elements are made of porous elastically damping material.



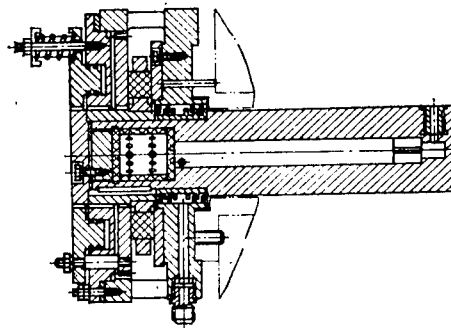
USSR

A BRAKE WITH AIR COOLING

Moscow OTKRYTIYA, IZOBRETENIYE, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI,
No 11, 78 Author's Certificate No 599107

KORNILOV, V. V., NOVIKOV, N. N., PIRALISHVILI, Sh. A. and SINEV, V. N.,
Rybinsk Aviation Technological Institute

[Text] A brake with air cooling containing a housing, a friction pair and brake shaft is distinguished by the fact that in order to improve the efficiency of cooling the friction pair, the brake shaft is equipped with a heat-insulated axial cavity in the brake installation zone and a separate choking cup seal from the axial cavity of smaller diameter made in the body of the shaft outside the brake installation zone. The cavity of small diameter is connected by means of tangential channels to a source of compressed air and by means of a radial orifice to the atmosphere. The large-diameter cavity is connected by means of inclined ventilation channels with the operating zone of the friction pair of the brake.



USSR

A DEVICE FOR SHAPING THE SPECTRUM OF RANDOM VIBRATIONS CONTAINING A
WHITE NOISE GENERATOR WITH WIDE-BAND FILTER

Moscow OTKRYTIYA, IZOBRETENIYE, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI,
No 11, 78 Author's Certificate No 599175

YURETSKIY, YA. S., MNEKIN, R. V., Kazan' Aviation Institute

[Text] A device for shaping the spectrum of random vibrations containing a white noise generator with wide-band filter at the exit, the first adder connected by one of the inputs to a wide band filter, an inversion unit, series connected second adder, power amplifier and vibrator and also parallel shaping channels, in each of which there is an amplifier filter which is tunable with respect to frequency, Q-factor and passband, the input of which is connected to the output of the wide band filter or to the output of the first adder, and a voltage divider connected to the output of the amplifier filter, the output of which is connected to one of the inputs of the first or second adder, is disclosed. The device is distinguished by the fact that in order to simplify the design, the inversion module contains one inverter, the input of which is connected to the output of the first adder, and the output is connected to the input of the second adder.

USSR

A DEVICE FOR SHAPING THE SPECTRUM OF A WIDE-BAND RANDOM VIBRATION

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI,
No 10, 1978 Author's Certificate No 597937

URETSKIY, YA. S. and MNEKIN, R. V., Kazan' Aviation Institute

[Text] A device for shaping the spectrum of a wide-bank random vibration containing parallel shaping channels, each of which includes a white noise generator, an amplifier filter connected to it and tunable with respect to frequency and pass band with controllable transmission coefficient, level controller, and comparison element, one of the inputs of which is connected to the level controller and the output is connected to the controlling input of the amplifier filter, a common adder, the inputs of which are connected to the outputs of the amplifier filters of all channels, and the output is connected to a power amplifier, a vibrator and correction circuits for the mutual effect of the channels,

each of which includes a channel adder, the inputs of which receives signals from the remaining channels. The device is distinguished by the fact that in order to improve the precision of shaping the spectrum at the given points of the frequency band, each of the correction circuits includes an inverter, the input of which is connected to the output of the channel adder and the output is connected to the second input of the comparison element, and voltage dividers, each of which is connected by its output to one of the inputs of the channel adder and by the input to the output of the level controller of the other channel.

USSR

UDC 531.36

STABILITY OF STEADY MOTION OF AN ASYNCHRONOUS GYRO IN A CARDAN SUSPENSION

Kiev MEKHANIKA TVERDOGO TELA (Collection of Articles) in Russian No 9,
Sep 77 pp 61-73 manuscript received 25 Nov 75

KONOSEVICH, B. I., Institute of Applied Mathematics and Mechanics,
Academy of Sciences Ukrainian SSR

[Abstract] A more general model of a gyro in a Cardan suspension is considered, namely one driven by an asynchronous motor, and the stability of its steady motion is analyzed. The necessary and sufficient conditions for stable motion are established on the basis of the Lagrange equations of kinetic and potential energy for a nonconservative mechanical system with three degrees of freedom and one cyclic coordinate. The rotor is dynamically symmetric and the gimbals are of arbitrary shapes. These equations are solved for four regions in the phase plane, with the aid of four theorems and two lemmas the proofs of which are also given here. Figures 2; references 10: 8 Russian, 2 Western.

USSR

UDC 531.383

PROBABILITY CHARACTERISTICS OF THE GIMBAL ERROR IN A DIRECTIONAL GYRO

Leningrad IZV. VUZ, PRIBOROSTROYENIYE in Russian Vol 20, No 5, Nov-Dec
77 pp 74-78 manuscript received 9 Nov 76

RIVKIN, S. S. and SVESHNIKOV, A. A., Leningrad Institute of Precision
Mechanics and Optics

[Abstract] The gimbal error, i.e., the error caused by mounting a gyro on an object and manifested in angular deviations of the gyro, becomes a random quantity when the object vibrates irregularly. The probability characteristics of this error are analyzed here, in the case of a directional gyro installed on a vessel for measuring the yaw angle. The gyro axis is oriented along the set course. The angles of keel and board rocking are reasonably assumed to be mutually uncorrelated random functions of time with zero mathematical expectations. The confidence intervals and the confidence factor as well as the relation between them are established, for a normal distribution and for the actual distribution, by integrating the probability density. Calculations are based on expressing the latter in terms of the MacDonald function of the zeroth order

(cylindrical function of the second kind of an imaginary argument) with the aid of an exponential representation. Standard deviations of the variables are estimated on the basis of trigonometric relations and simple small-angle approximations. A numerical example, based on a standard deviation of the gimbal error equal to 0.00426, indicates an error not larger than $\pm 54'$ with a 99% probability. Figures 1; tables 2; references 4: 3 Russian, 1 Western.

USSR

UDC 531.383

EFFECT OF FORCED GYRO ROTATION ON THE STABILITY OF A FORCE STABILIZER

Leningrad IZV. VUZ, PRIBOROSTROYENIYE in Russian Vol 20, No 5, Nov-Dec 77
pp 78-83 manuscript received 10 Aug 76

ZEL'DOVICH, S. M. and OKON, I. M., Leningrad

[Abstract] A force stabilizer for two-stage gyros is considered and the differential equations of its motion due to forced rotation of the gyro pair are derived. These equations are subsequently reduced to two algebraic parametric equations with complex coefficients, and the stability conditions are established in terms of positivity of the real parts of their nonzero roots. The results indicate that forced rotation increases the stability margin within a narrow range of angular velocities, the latter characterized by a viscous friction torque lower at the stability limit than at zero angular velocity. A large kinetic moment appreciably weakens the effect of angular velocity on the stabilizer stability. Figures 3; references 3 (Russian).

USSR

UDC 531.383

STABILITY OF A BIAxIAL INDICATING GYRO STABILIZER DURING ROTATION OF A
THREE-STAGE GYRO SET

Leningrad IZV. VUZ, PRIBOROSTROYENIYE in Russian Vol 21, No 1, Jan-Feb 78
pp 63-68 manuscript received 20 Apr 77

OKON, I. M., Leningrad

[Abstract] Self-compensation of gyro drifts has been used effectively for improving the accuracy of gyro indications. An exact analysis of the gyro stabilizer performance during forced rotation of the gyro set involves fourth-order differential equations with periodic coefficients. Here the Lyapunov forward method is employed in the case of an indicating stabilizer with a three-stage gyro set. The equations of motion are written in accordance with precession theory, considering that the frequency of nutations is very high and that the latter are damped rather fast by viscous friction. The thus established stability conditions extend to a gyro stabilizer without forced rotation and with axes not coinciding with the gyro axes. Figures 1; references 5 (Russian).

USSR

UDC 531.36

STABILITY OF REGULAR PRECESSION MODES IN THE CASE OF A SYSTEM OF TWO
LAGRANGIAN GYROS

Kiev MEKHANIKA TVERDOGO TELA (Collection of Articles) in Russian No 9,
Sep 77 pp 34-40 manuscript received 29 Sep 75

KONONYKHIN, G. A., LESINA, M. YE. and SAVCHENKO, A. YA., Donetsk Poly-
technic Institute

[Abstract] P. V. Kharlamov has derived equations of motion for a system of n Lagrangian gyros and established the conditions under which regular precession of such a system can occur. Here it is shown that a system of two such gyros ($n=2$) can move only in two steady uniform precession modes, according to A. Ya. Savchenko, and the stability of these precession modes is analyzed. References 4 (Russian).

REGARDING CERTAIN STATEMENTS ABOUT THE INTEGRATION OF THE EQUATIONS OF MOTION FOR A HEAVY SOLID BODY WITH A FIXED POINT

Kiev MEKHANIKA TVERDOGO TELA (Collection of Articles) in Russian No 9, Sep 77 pp 45-58 manuscript received 3 Sep 75

KHARLAMOVA, YE. I. and STEPANOVA, L. A., Donetsk Polytechnic Institute

[Abstract] The problem of integrating the equations of motion for a heavy solid body with a stationary point is reviewed and three sources of error in certain statements which have led to the solution are indicated. In the classical formulation there must be considered the complete system of six equations, three of them to be integrated. First of all, sometimes a replacement of some of these equations results in a nonhomogeneous system of dependent equations and the solution to these cannot, without checking, be regarded as a solution to the original equations. Secondly, under certain conditions the principal variables of the problem can be related to one another on the basis of only some of the original equations and then the compatibility of this relation with the remaining original equations must be checked for nonredundancy as well as nontriviality. Thirdly, a new solution found may really be an already known solution written in a nonconventional form. These precautions are now applied to the typical problem of a gyrostat, and the possibility of extraneous solution is established. More generally, the errors are pinpointed in theorems on the basis of which solutions with nonlinear invariant relations and solutions with linear invariant relations have been constructed. Accordingly, the application to this particular problem of theorems by W. Hess (1890), P. A. Schiff (1903), P. Field (1934), J. J. Corliss (1932-34), R. Fabbri (1934), G. Agostinelli (1949), P. V. Myasnikov (1953-54), I. A. Arzhanykh (1954), T. I. Balanov (1962), I. A. Keys (1963-65), and M. P. Gulayev (1971) is viewed critically and the incorrectness explained in each case. References 56: 38 Russian, 5 German, 13 Western.

USSR

UDC 531.38

SEVERAL VARIANTS OF ONE SOLUTION TO THE PROBLEM OF A MOVING BODY WITH
A FIXED POINT

Kiev MEKHANIKA TVERDOGO TELA (Collection of Articles) in Russian No 9,
Sep 77 pp 17-24 manuscript received 8 Jan 75

KHARLAMOV, P. V., Institute of Applied Mathematics and Mechanics, Academy
of Sciences Ukrainian SSR

[Abstract] The exact solution to the problem of a moving heavy solid body with one stationary point has, in its most general form, eight independent parameters. It is shown here that, if the solution contains no redundant parameters, four different variants are possible. In the fundamental equations a variable is first introduced which is an elliptic function of time and, on this basis, the principal parameters of the problem are now replaced by new parameters with appropriate constraints within an elliptic region. The four variants of the solution differ, essentially, by different signs of various derived parameters. Figures 1; references 4 (Russian).

USSR

UDC 531.38

PRECESSIONS ABOUT THE VERTICAL OF A HEAVY SOLID BODY WITH A FIXED POINT

Kiev MEKHANIKA TVERDOGO TELA (Collection of Articles) in Russian No 9,
Sep 77 pp 3-17 manuscript received 7 May 74

GORR, G. V., Institute of Applied Mathematics and Mechanics, Academy of
Sciences Ukrainian SSR

[Abstract] Precession about the vertical of a heavy solid body with one stationary point is analyzed on the basis of the fundamental equations of motion with Euler angles as variables. The simplest case is regular precession of a physical pendulum. Several theorems are proved here regarding the impossibility of precession under certain constraints on angular velocities, the possibility of semiregular precession, and the necessary conditions for the most general precession modes. References 12: 5 Russian, 7 Western.

USSR

UDC 621.225

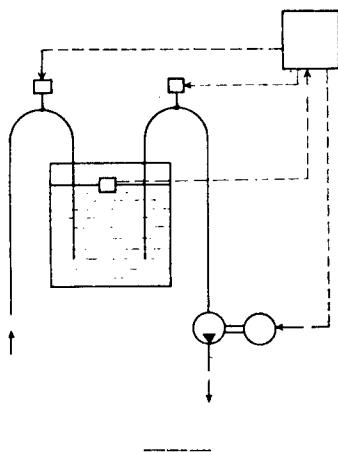
A HYDRAULIC DRIVE PROTECTION SYSTEM

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
in Russian No 17, 1978 p 113

[Description of Author's Certificate No 606016 Division F, filed 11 Oct
76, published 5 May 78]

KUKOVITSKIY, F. V. and TASKAYEV, V. V., Sytyvkar Experimental Marine
Engineering Plant

[Text] This Author's Certificate introduces a hydraulic drive protection system that contains a tank for the working fluid, a main dump line and a collector line in the form of a siphon with the bend situated higher than the maximum permissible fluid level in the tank. A hole in the top of the bend is open to the atmosphere. As a distinguishing feature of the system, reliability is improved by the addition of a unit to signal leakage of working fluid and a control module. In addition, the main dump line is made in the form of a siphon with the bend situated above the permissible fluid level in the tank and with a hole that is open to the atmosphere. The openings in the lines are fitted with valves, and the unit for signaling leakage of working fluid is connected to the valves and to the pump through the control module.



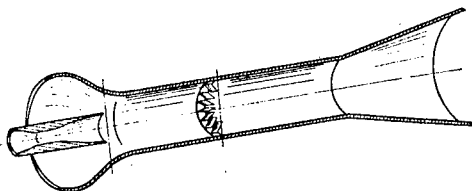
A GAS EJECTOR

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
in Russian No 17, 1978 p 112

[Description of Author's Certificate No 606012 Division F, filed 10 Jun
76, published 5 May 78]

BAYKOV, V. S. and VASIL'YEV, I. YU.

[Text] This Author's Certificate introduces: 1. A gas ejector that contains an active nozzle, a mixing chamber and an impeller for swirling the active medium. As a distinguishing feature of the ejector the overall axial dimension is reduced by placing the impeller in the mixing chamber. 2. A modification of this ejector distinguished by the fact that the impeller is located at a distance of $2.0-0.5D$ from the inlet section of the chamber, where D is the diameter of the outlet section of the mixing chamber. 3. A modification of the ejector covered in point 1, distinguished by the fact that the average length of each [impeller] vane at the outlet is inclined to the axis of the ejector at an angle of $5-25^\circ$.



USSR

UDC 621.472

THE OUTLOOK FOR CENTRIFUGAL CASTING IN PRODUCING LARGE REFLECTING SURFACES

Tashkent GELIOTEKHNIKA in Russian No 2, 1978 pp 14-19 manuscript received 28 Sep 77

ZAKHIDOV, R. A., Central Technological Office for Planning and Design of Scientific Instruments, Academy of Sciences Uzbek SSR

[Abstract] An examination is made of the possibilities for using centrifugal casting to produce large solar reflectors made from fiberglass-reinforced epoxy compound. Calculations show that the conventional centrifugal casting machine would require nine metric tons of mercury in the separative sublayer to make a dish 10 m in diameter. The difficulties involved are avoided by a new design called a rod type centrifugal casting machine. This design eliminates the need for a monolithic dish. All that is required is a rod that swings about a pivot and carries the casting mold at the required distance from the pivot. Thus elements can be made in the form of sectors, trapezoids and so forth that are precision off-axis sections of a paraboloid of revolution with excellent surface finish, resulting in a composite solar concentrator of the required size. Details are given on such a device for making reflectors 16 m in diameter, and it is shown that a vertical casting machine of this type is technically feasible for making 50-meter dishes with concentrator area of about 2000 m² and thermal power of 1000 kW. Figures 5, references 5 (Russian).

USSR

UDC 662.93

SPECIFICS OF THE OPERATION OF THE COMBUSTION CHAMBER OF THE P-57 STEAM GENERATOR OF THE 500-MW POWER UNIT WHEN BURNING EKIBASTUZ COAL

Moscow TEPLOENERGETIKA in Russian No 3, Mar 78 pp 26-30

SUCHKOV, V. I., OSLOPOV, O. I., Urals Institute of Heat Engineering

[Abstract] The P-57 steam generator of the 500 MW generator unit of the Troitskaya Regional Electric Power Plant was specially planned for the combustion of Ekibastuz coal, considering the operating experience of smaller steam generating units and extensive scientific research work. This steam generator is a prototype for the many steam generators which will be constructed in the future to burn this type of coal. The operating

characteristics of the steam generator combustion chamber are described in detail. The primary shortcoming of the operation of the gas and air-carrying sections is the high flow resistance of the air heater. Inspection of a regenerative air heater during a shutdown showed that the passages were partially obstructed with caked accumulations of near-spherical ash particles up to 5-6mm in diameter. The studies of the combustion chamber performed showed that Ekibastuz coal can be burned in this combustion chamber over a broad range of conditions with efficiency at the level of the world standard. Figures 3; references 2 (Russian).

USSR

AN INSTRUMENT FOR CONSTRUCTING THE PROFILE OF A PRODUCT

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
No 10, 1978 Author's Certificate No 597919

KRIVOROTOV, A. A.

[Text] An instrument for constructing the profile of a product made up of a flexible standard strip and coordinate recorder containing a housing with two mutually perpendicular base screws, two screws placed in parallel to the base screws, nuts installed on the screws and connected to each other by parallel rods, the mechanism for synchronous rotation of the parallel screws, angular counters connected to the base screws, the assembly for grouping the standard strip including bushings on rods with the possibility of translational displacement along the rods, a roller connecting the bushings of the mutually perpendicular rods and the standard strip clamp. It is distinguished by the fact that in order to improve the efficiency of the process of constructing the profile of the product considering the magnitude of the shrinkage of the material, for example, during casting, the screws are made with threaded sections, the thread pitches of which are proportional to the distance from the middle of the screw to its edges, and the nuts are installed on each threaded section.

USSR

A PROCEDURE FOR THERMOMECHANICAL DRILLING AND WIDENING OF A WELL AND
A DEVICE FOR IMPLEMENTING IT

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
No 10, 1978 Author's Certificate No 597835

DMITRIYEV, A. P., GONCHAROV, S. A., GORYAYEV, V. YE., MOCHALOV, V. I.,
KAPUSTIN, A. A., KRYUCHKOV, I. I. and KUCHMA, N. F.

[Text] A procedure for thermomechanical drilling and widening of a well and a device for implementing it. 1. A procedure for thermomechanical drilling and widening of a well in which the well is drilled by a mechanical rock crushing tool and it is simultaneously widened above it by means of high temperature gas jets produced by burning fuel in an oxidizer used for removal of drilling mud from the bottom of the well. The procedure is distinguished by the fact that in order to simplify the process and increase its efficiency, the fuel is burned in the casing space of the well in a flow of spent oxidizing agent coming from the bottom of the well. 2. A device for implementing the procedure according to item 1. which contains a mechanical rock-crushing tool connected to the drill stem and a combustion chamber placed above it with a nozzle for escape of a gas and equipped with a jet for injecting fuel and a swirler for the oxidizing agent. The device is distinguished by the fact that the combustion chamber is formed in the annulus between the swirler and the flange which are mounted in series on the drill stem above the tool. The nozzle is made as an annular slit between the end of the flange and the well wall.

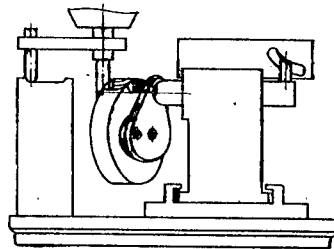
USSR

A DEVICE FOR MACHINING TURBINE AND COMPRESSOR VANES

Moscow OTKRYTIYA, IZOBRETENIYE, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
No 11, 78 Author's Certificate No 598707

TRAPEZNIKOV, P. S. and MIRONOV, YE. M.

[Text] A device for machining turbine and compressor vanes including a spindle stock with dividing disk installed with the possibility of reciprocal displacement from a former and bearing a chuck with the product installed with the possibility of rotation from above the former is disclosed. It is distinguished by the fact that in order to improve the machining precision and finish, it is equipped with an additional former for vertical displacement of the milling cutter, and the axis of the dividing disk and the chuck is arranged eccentrically with respect to the axis of the spindle stock and at an angle to it so that the axis of the spindle stock will coincide with the chord of the base cross-section of the vane profile.



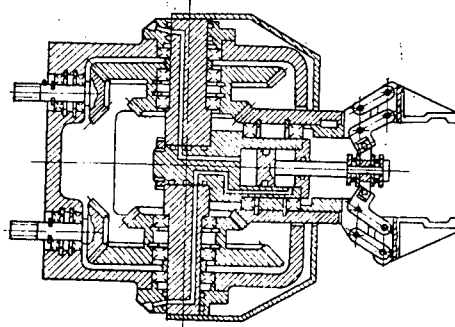
USSR

A MANIPULATOR HAND

Moscow OTKRYTIYA, IZOBRETENIYE, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
No 11, 78 Author's Certificate No 598749

BABICH, V. V., SAVEL'YEV, V. V. and SURNIN, B. N.

[Text] A manipulator hand containing a housing with rocker shaft, bevel differential and power drive cylinder for the grip is distinguished by the fact that in order to improve the operating quality, the power cylinder is installed stationary with respect to the rocking shaft of the hand, and the output pinion of the differential is installed on the housing of the power cylinder with the possibility of rotation about its longitudinal axis.



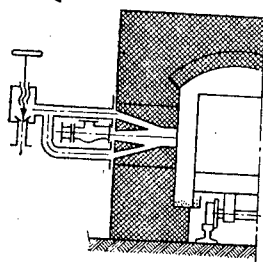
A TUNNEL FURNACE

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
in Russian No 17, 1978 p 130

[Description of Author's Certificate No 606078 Division F, filed 14 Jun
76, published 5 May 78]

ZHURAVLEV, G. I., SHUTYY, G. V., MYAGKOV, N. D., GORODOV, N. N. and
NAKHAMKIN, N. A., Kristall Experimental Technological Design Office with
the Experimental Production Facility of the Leningrad Institute of
Technology imeni Lensovet

[Text] This Author's Certificate introduces: 1. A tunnel furnace that
contains a working channel with heat extraction, warmup, ignition and
cooling zones, burners that are located in the lower part of the side walls,
gas-feed and air-feed lines. As a distinguishing feature, the pro-
ductivity of the furnace is increased and the quality of the annealed
items is improved by fitting the burners with tapered mixers inclined
to the axis of the channel toward the furnace inlet. These mixers
have air-feed ducts fitted with chokes that are installed at the inlet
and open to the atmosphere and are inclined at an angle of 30-40° to the
burner axis. 2. A modification of this furnace distinguished by the
fact that the spacing between the burner axes is 6-10% longer than the
truck. 3. A modification of the furnace covered in point 1, distinguished
by the fact that the length of the extraction zone is 6-10%, and the
length of the ignition zone is 42-46% of the total length of the working
channel.



USSR

A DIGITAL OHMMETER

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
No 10, 1978 Author's Certificate No 597987

BESPALOV, A. I. and TYUTYUNIK, M. I., Ufa Aviation Institute

[Text] A digital ohmmeter containing a null element connected to a control module, for decades of standard resistors, a measured resistor, current source and two commutators is distinguished by the fact that in order to increase the measurement precision, it is equipped with an additional standard resistor, one output of the first decade of standard resistors is connected through the series-connected measured resistor and second standard decade to one input of the null element, one output of the third standard decade is connected through the series connected auxiliary standard resistor and fourth standard decade to the other input of the null element. The first two outputs of the current source are connected to the corresponding inputs of the first commutator, the third and fourth outputs are connected to the corresponding inputs of the second commutator, and the other outputs of the first and third standard decades are connected to each other.

USSR

UDC 620.179.16

A DEVICE FOR MEASURING THE SPEED OF SOUND IN LIQUIDS

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
in Russian No 17, 1978 p 141

[Description of Author's Certificate No 606127 Division G, filed 13 Jan 75, published 5 May 78]

FUKS, B. K., MALAKHOV, B. M. and VAREYCHUK, N. S., Central Scientific Research Institute of Geodesy, Aerial Surveying and Cartography

[Text] This Author's Certificate introduces a device for measuring the speed of sound in liquids that contains a piezoelectric transducer receiver and an amplifier connected in series, and a piezoelectric radiating transducer and a registration unit. As a distinguishing feature of the patent, the dynamic measurement range is extended, and the design is simplified by adding a master frequency oscillator and switching stage connected in series, the output of the switching stage being connected to the amplifier, while the output of the amplifier is connected to the radiating piezoelectric transducer and the registration unit.

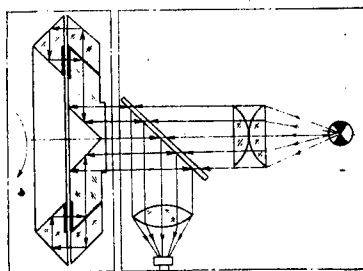
A PHOTOELECTRIC DEVICE FOR MEASURING ANGULAR ACCELERATIONS

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
in Russian No 17, 1978 p 143

[Description of Author's Certificate No 606137 Division G, filed 2 Aug
76, published 5 May 78]

SHVAB, I. A.

[Text] This Author's Certificate introduces a photoelectric device for measuring angular accelerations that contains a sensing element made in the form of an inertial ring fastened by elastic constraints to the shaft to be checked, a light source, a condenser lens, an annular illuminator and light flux collector coaxial with the shaft, a photocell, and cylindrical raster gratings, one secured to the inertial ring and the other secured to the shaft. As a distinguishing feature, in order to prevent reverse pulsations of the useful signal, a beam splitter is added that is placed between the light source and the light flux collector that picks up luminous flux that is separated from the annular illuminator by a semi-transparent layer.



USSR

UDC 550.834

A DEVICE FOR SUSPENDING A LOW-FREQUENCY SEISMIC SIGNAL RECORDER IN THE
NEAR ZONE OF SIGNAL EXCITATION

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
in Russian No 17, 1978 p 146

[Description of Author's Certificate No 606148 Division G, filed 10 Mar
76, published 5 May 78]

DENISKOV, A. S., KUZNETSOV, O. P. and NEDOSHIVIN, N. I., "Order of Lenin"
Institute of Physics of the Earth imeni O. Yu. Shmidt

[Text] This Author's Certificate introduces a device for suspending a
low-frequency seismic signal recorder in the near zone of signal excitation.
The device contains shock-absorbing elements made in the form of eight
rubber tension members fastened to the corners of the recorder and to the
housing of the instrument section. As a distinguishing feature of the
device, to reduce the influence of ground vibrations on the sensitivity
of the recorder elements, an additional tension member is fastened to each
corner of the recorder. The points of fastening of the two tension
members emanating to the instrument section from one corner of the
recorder are located in the vertical plane that passes through the opposite
corner of the recorder along the diagonal of the corresponding base,
and the angles formed by the tension members of the upper and lower bases
respectively range from 30 to 60°. The tension members of the upper
base of the recorder slide in rubber tubular shock absorbers fastened
at one end to the tension members, and the length of each shock absorber
does not exceed three-fourths of the length of the tension member.

USSR

UDC 621.472

DEVICE WITH SECTIONAL PHOTORECEIVER AND LASER EMITTER FOR DETERMINING
THE PRECISION CHARACTERISTICS OF SOLAR RADIATION CONCENTRATORS

Tashkent GELIOTEKHNIKA in Russian No 1, 1978 pp 30-35 manuscript received
26 Apr 76

KRASIOVSKIY, V. I., TARNIZHEVSKIY, B. V. and TVER'YANOVICH, E. V., All-
Union Order of the Labor Red Banner Scientific Research Institute of
Current Sources

[Abstract] A simple method of estimating local electrical precision
characteristics of solar radiation concentrators was developed in which

the linear or angular aberration constitutes the estimate of the local surface errors of the mirror, and the distribution of the energy density with respect to the focal image is the integral error. A device that implements this method is described, the basic elements of which are a laser emitter, the beam of which is parallel to the optical axis of the tested paraboloid concentrator and a photoreceiver in the form of a silicon photoconverter placed in the focal plane. The procedure for determining the integral characteristic of the investigated concentrator, the spatial configuration of the density distribution of the radiant flux over the focal plane, was based on measuring the statistical distribution pattern of the reflected beams over the focal plane with subsequent laser beam illumination of a large number of points on the concentrator surface. The calculated values of the angular aberrations of the mirror reflectors are presented in a table, and the distribution of the energy density at the focal point of the paraboloid mirror 1.5 meters in diameter and 0.94 meters in diameter is plotted.

USSR

UDC 535.853.36.084.001.24

DESIGN OF THE SINE MECHANISM IN THE SFK-601 SPECTROPHOTOMETER

Moscow METROLOGIYA in Russian No 3 Mar 78 pp 13-16

ALEKSEYEVA, M. I.

[Abstract] A procedure is described for calculating the sine mechanism used in the SFK-601 spectrophotometer based on the theory of diffraction gratings. The admissible calibration error for the discussed mechanism is ± 2 mm with 600 lines per mm and an angle between the incident and diffracted beam of 35 degrees. The relation between the screw pitch and the length of the arm of the sine mechanism is derived, and the errors in determining the wavelength in the spectrophotometer are calculated.

USSR

UDC 624.012.4:624.92:539.4

INSTALLATION FOR TESTING OF THE STRENGTH OF CONCRETE OF MONOLITHIC
STRUCTURES

Moscow BETON I ZHELEZOBETON in Russian No 5, May 78 pp 25-26

LESHCHINSKIY, M. YU., POPOV, V. N., Central Scientific Research Laboratory
of Kiev Main Administration for Construction, KHAYUTIN, YU. G., DORF, V. A.,
Orgenergostroy

[Abstract] An installation has been developed for holding of cubic
specimens in a temperature mode similar to the actual temperature mode of
curing of concrete in monolithic structures. Testing of structures with
this instrument produces objective information on the actual strength of
the concrete in the structure as it is heated by the exothermic reactions.
The use of the installation for production testing is recommended, regard-
less of the method of heat treatment of the concrete used in monolithic
structures. Figures 3; table 1.

USSR

UDC 620.178.311.868

A METHOD OF STUDYING THE FATIGUE RESISTANCE OF THE MATERIAL OF GAS TURBINE
ENGINES EXPOSED TO CORROSIVE MEDIA

Moscow ZAVODSKAYA LABORATORIYA in Russian No 4, 1978 pp 467-470 manuscript
received 10 Jun 77

KHAR'KOV, V. P.

[Abstract] An ejector-type device was constructed for corrosion-fatigue
testing, in which liquid corrosive media are applied to the object being
tested by spraying. Specimens were tensile tested in a spray consisting
of a 3% NaCl solution under variable stress, then were stressed to
failure in air without salt. Ninety-four specimens of 1Kh12NVMF steel
were tested and it was found that the corrosion fatigue curves of this
steel and silicon-nickel steel are accurately described by an exponential
equation over a broad interval of stresses and frequencies. Figures 5;
tables 2; references 3: 1 Russian, 2 Western.

USSR

UDC 532.57+532.137+536.51+532.14.08+551.787

THE DIAGNOSIS OF SUPERSONIC 2-PHASE STREAMS ON THE BASIS OF SCATTERED
LASER RADIATION

Novosibirsk ZHURNAL PRIKLADNOY MEKHANIKI I TEKHNICHESKOY FIZIKI in Russian
No 2, Mar-Apr 78 pp 36-46 manuscript received 17 Feb 77

ALKHIMOV, A. P., BOYKO, V. M., PAPYRIN, A. N. and SOLOUKHIN, R. I.

[Abstract] A laser Doppler velocimeter has been developed for the investigation of high-velocity 2-phase jets. The experiments performed with the instrument show that the method of high-speed laser photographic recording, which can determine a number of parameters such as the dimensions of concentration of particles, in combination with laser Doppler velocity measurement, can be successfully used to perform a broad range of tasks related to the study of the dynamics of particles in high velocity 2-phase jets. A diagram of the laser installation and several photographs of jets are presented. Figures 6; references 12: 10 Russian, 2 Western.

USSR

UDC 535.853.4

A MODEL OF A SPECTROMETER WITH INTERFERENCE SELECTIVE AMPLITUDE MODULATION
OF MODERATE RESOLUTION

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 78
pp 27-29 manuscript received 14 Apr 77

ARKHIPOV, V. M., GUSEV, O. N. ROZUVANOVA, V. A. and UVAROV, V. F.

[Abstract] A small sisam [spectrometer with interference selective amplitude modulation], the SP-140, designed to operate in the 0.7-2 μm range, is described. The operating principle of the sisam is based on the use of two phenomena -- selective interference and interference modulation. The procedure to be used in operating the sisam is described. A kinematic diagram of the modulation system is presented, as well as a photograph of the instrument and a recording of the He line produced on the instrument. The resolving capacity of the sisam is greater than the resolving capacity of the two diffraction gratings it contains. The half-width of the instrument function is not over 0.35 A. Figures 3; references 5: 4 Russian, 1 Western.

USSR

A BENCH FOR INVESTIGATING THE PROCESS OF JET FLAME DRILLING

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
No 10, 1978 Author's Certificate No 597832

YASTREBOV, YE. K., STYRON, B. K. and STYRON, L. V.

[Text] A bench for investigating the process of jet flame drilling containing a model of a well filled with fluid and equipped with sensors for measuring the thermal gas dynamic parameters and made in the form of side walls and a bottom, the cavity of which serves for placement of the thermal gas generator with nozzle head, is distinguished by the fact that in order to simulate the various aerodynamic resistances to the exit flow of gases, the model of the well is equipped with two mutually moving slide valves overlapping its mouth and having asymmetrically arranged openings for passing the thermal gas generator and serving to regulate the exit cross-section of the well model during its own mutual displacement.

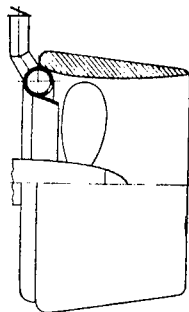
A UNIT FOR TESTING PROPULSION DEVICES WITH PROPELLERS

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
in Russian No 17, 1978 p 49

[Description of Author's Certificate No 605749 Division B, filed 29 Mar
76, published 5 May 78]

GRITSENKO, A. K. and SHCHERBAN', M. M.

[Text] This Author's Certificate introduces a unit for testing propulsion devices with propellers, mainly in shrouds, at mooring and under way. The unit contains an air distributor that consists of two parts that are joined together and equipped with self-contained air ducts. As a distinguishing feature of the unit, the design is simplified and reliability is improved by making the air distributor toroidal with orifices, and fitting it with a flap securely fastened to the inside surface of the air distributor. The orifices are on the side facing the propeller, and the air distributor is fastened to the inlet edge of the shroud.



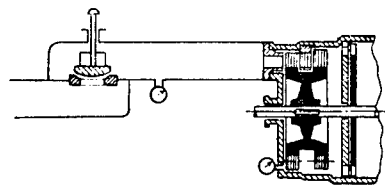
A DEVICE FOR CHECKING THE POSITION OF A STEAM TURBINE REGULATING VALVE

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
in Russian No 17, 1978 p 108

[Description of Author's Certificate No 605997 Division F, filed 28 Jun
76, published 5 May 78]

BOSAKOVSKIY, I. L., BELITSKIY, N. F. and KRIVOSHEYEV, A. A.

[Text] This Author's Certificate introduces: 1. A device for checking the position of a steam turbine regulating valve equipped with a displacement mechanism. The device contains a pressure sensor communicating with the steam space beyond the valve cup and connected to a measurement module. The output of this module is connected to an automating and signaling system. As a distinguishing feature of the device, the accuracy is improved by adding another pressure sensor connected to the steam space of the chamber of the regulating stage of the turbine, and the measurement module is made in the form of a relay amplifier and comparison circuit connected in series. The outputs of the pressure sensors are connected to the inputs of the comparison circuit. 2. A modification of this device distinguished by the fact that the economy of turbine operation is increased by adding a working mode selector installed in a circuit between the relay amplifier and the displacement mechanism, and still another pressure sensor that communicates with the steam space of the chamber of the regulating stage of the turbine, is equipped with a control point setter and is connected to the input of the relay amplifier.



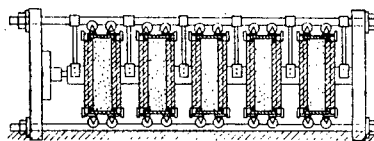
A DEVICE FOR TESTING AIRFIELD AND ROAD SURFACES

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
in Russian No 17, 1978 pp 142-143

[Description of Author's Certificate No 606134 Division G, filed 21 Jun
76, published 5 May 78]

SIL'CHENKO, L. A. and ARBUZOV, N. T., Aeroprojekt State Planning and Design
Scientific Research Institute of Civil Aviation

[Text] This Author's Certificate introduces: 1. A device for testing airfield and road surfaces that includes a power frame, a pulsator, a punch and an elastic base that is enclosed in a box. As a distinguishing feature of the device, provision is made for simultaneous testing of a series of surfaces under identical conditions. To this end, the device is equipped with additional boxes with bases, punches, and horizontal guides that are fastened to the power frame. The boxes and punches are mounted on these guides. Each box is located between two punches, and the elastic base in each box is located between the surfaces to be tested. 2. A modification of this device is distinguished by the fact that the elastic base is made in the form of a closed elastic cavity filled with liquid or gas.



CZECHOSLOVAKIA

A SYMMETRICAL SYSTEM AS A REFERENCE RECEIVER IN OPTICAL RADIOMETRY

Prague JEMNA MECHANIKA A OPTIKA in Slovak Vol 23, No 1, Jan 78 pp 7-11

ZATKOVIC, Juraj, Czechoslovak Metrological Institute, Bratislava

[Abstract] A modified Gillham's radiometer is described. The instrument was converted to a symmetrical receiver of optical radiation with an independent calibration system based on the development of a complex of independent differential thermal batteries on both sides of a target which is heated by the optical radiation. The author developed equations for the determination of the losses in the density of the thermal output from the surface of the material of the target, when the target absorbs the optical radiation on its surface. The equations can also be used to calculate the intensity of the optical radiation which is received on the surface of the symmetrical radiometer. The source of the optical radiation used in the study was an ordinary 100-W bulb. The absorption of radiation of the symmetrical receiver was compared to that of a black body. The measurements confirmed the equations developed by the author. The absorption coefficient of the receiver's body should be determined experimentally. This method does not need the determination of the physical and thermal parameters of the materials used in the target. The instrument developed by the author is characterized by a good heat removal from the surface of the target and a resulting low time constant of the receiver. Figures 3; tables 1; references 13: 5 Czechoslovak, 2 Russian, 6 Western.

YUGOSLAVIA

UDC 621.316.825:621.382.2=861

A DIODE THERMOMETER

Belgrade TEHNIKA in Serbo-Croatian No 3, 1978 pp 427-429

DAMLJANOVIC, DRAGOLJUB, MA, Graduate Engineer, The "Boris Kidric" Institute Laboratory for Electronics, Vinca

[Abstract] The thermometer discussed was developed for use in circumstances where variations of half a degree or more were not critical. Principles of diode thermometer functioning are discussed, especially relating to the silicium diode used in the present application. The thermal conductivity of the ambient medium is connected to the potential error of the thermometer, which as developed at the Vinca laboratory was usable in the temperature range of 0-100°C, and less accurate outside that range. A technical description of the diode thermometer, and the possibility of attaching a recording device, is presented. Figures 3; references 22: 1 Serbo-Croatian, 21 English.

USSR

UDC 629.1.053.12

THE SPT-2 NAVIGATIONAL SEXTANT

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 78
pp 24-26 manuscript received 31 Dec 77

RADKEVICH, L. P.

[Abstract] A description is given of the SPT-2 navigational sextant, a hand-held sextant with a six power telescope, field of vision 15° , mean square error of measurement $\pm 10''$ under normal conditions, $\pm 20''$ with temperature variations between -10 and $+50^\circ\text{C}$. The sextant is enclosed in a case, with two protruding cylindrical handles: the left handle contains a stopwatch; the right handle is used to adjust the moving mirror system of the sextant. The SPT-2 sextant has passed laboratory tests in the plant and has been shown to be reliable in operation under a variety of conditions. Figures 4; references 2 (Russian).

USSR

UDC 535.371.08

THE NEVA SPECTROFLUORIMETER

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 78
pp 32-36 manuscript received 20 Oct 77

KARALIS, V. N., KORNEYEVA, E. A., KOROLEV, A. N., TACHKIN, N. N. and
TUL'YEV, N. N.

[Abstract] The National Scientific Research Institute for Scientific Instruments and The National Scientific Research Institute for Metrology imeni D. I. Mendeleyev have developed and manufactured experimental models of a spectrofluorimeter, the "Neva-01," and subjected them to state acceptance testing. The device is designed for qualitative and quantitative analysis of the composition of solids and liquid specimens excited by monochromatic light. An optical diagram of the device is presented, plus sample excitation and fluorescence spectra and a list of the technical characteristics of the instrument. Figures 4; references 6: 5 Russian, 1 Western.

USSR

UDC 681.785.452

THE FL LUMINESCENT PHOTOMETER

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 78
pp 29-32 manuscript received 18 Jul 77

ALEKSEYEVA, M. I., YEFREMOV, V. P., KALUGIN, A. I., STEPANCHAK, YE. I.
and SHIFFERS, L. A.

[Abstract] A new luminescent photometer is described, intended for determination of the concentration of substances in solutions by fluorometry by means of construction of calibration graphs using standard solutions. The new FL instrument, series production of which was begun in 1977, is distinguished from the other models of fluorimeters produced in the Soviet Union for quantitative analysis in that they are not designed for recording of the spectral characteristics of fluorescence and are not as sensitive as foreign spectrofluorimeters. Figures 3; tables 2; references 3: 2 Russian, 1 Western.

USSR

UDC 621.565.912:629.123.44

A PLATE-TYPE FREEZER

Moscow KHOLODIL'NAYA TEKHNIKA in Russian No 3, 1978 pp 9-13

KATERUKHIN, V. V., SMOILOVSKAYA, I. A., KUZNETSOVA, L. A., National Research Institute for Refrigeration Machinery, KHITIN, V. SH., PLESHKANOVSKIY, YU. P., KALASHOV, V. P., FAYNGOL'D, A. M., Kiev Plant and Central Design Bureau "Leninskaya Kuznitsa," and VILENCHIK, YU. G., "Melitopol'kholodmash" Production Union

[Abstract] An independent horizontal-plate freezer type AMP-1.6K with a small built-in low-temperature refrigeration unit has been developed for use on shrimp boats. The unit can freeze shrimp packaged in cardboard boxes measuring 180x92x62, 246x131x68 or 318x150x65mm, containing 0.5, 1.0 and 2.25kg of shrimp, respectively, as well as fish in packages measuring 250x800x60-65mm. The capacity of the apparatus, assuming an initial temperature of the product of 30 C and a final temperature at the center of the product of -23 C, is about 2.5t/day of fish or 1.6t/day of shrimp (considering container filling factors). The design and operation of the device are described, and drawings and schematic diagrams are presented. Figures 4; tables 2.

USSR

UDC 621.57.042

DESIGN OF SUCTION VALVES WITH SPRING-LOADED PLATE AND WITHOUT LIFT LIMITER

Moscow KHOLODIL'NAYA TEKHNIKA in Russian No 5, May 78 pp 27-30

AFANAS'YEVA, I. A., All-Union Scientific Research Institute of Refrigeration Machinery

[Abstract] Valves for single-stage refrigeration compressors must be capable of operation at boiling temperatures down to -50°C with a low hydraulic drag and a small dead-zone volume. Suction valves opening directly into the cylinder without a lift limiter along the deflection line satisfy these requirements. Such a valve is shown here with a spring-loaded plate, designed for operation at boiling temperatures from -50 to +10°C and a corresponding compression ratios of 2-24, gas pressures from 6.3 to 68.5 kPa, gas densities from 3 to 27 kg/m³, and gas temperatures from 20 to 150°C. The dynamic characteristics of this valve are calculated from the equation of gas dynamics with empirical constants and with the

Reynolds number as a principal parameter. Its mechanical strength is calculated in terms of flexural stresses during opening and contact stresses during seating. The pressure head loss and the energy losses are determined, furthermore, the latter reducing the overall compressor efficiency by 2-5%. Figures 5; references 2 (Russian).

Transportation

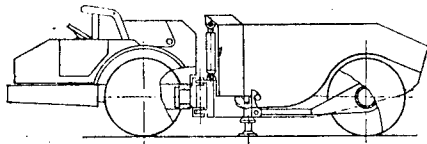
USSR

A DUMPING TRACTOR-TRAILER

Moscow OTKRYTIYA, IZOBRETENIYE, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
No 11, 78 Author's Certificate No 598790

LITVINOV, YU. N. and BORODULIN, A. I.

[Text] 1. A dumping tractor-trailer unit made up of a single-axle tractor and dumping semi-trailer equipped with a hydraulic cylinder for raising the bed and joined by a hinged hitch and hydraulic turning cylinders is distinguished by the fact that in order to increase the useful volume of the semi-trailer bed while retaining its outside dimensions, the semi-trailer bed is made bearing, supported in the given section by axles on the wheels of the semi-trailer, and it is equipped with a bearing plate with holes connected by the hinged hitch to the tractor and by pins to the axles of the semi-trailer wheels and bearing a stop device for locking the bed in the transport position and supporting hydraulic jacks. The hydraulic cylinder for raising the bed of the semi-trailer is locked with the hydraulic cylinders for turning the motor vehicle train and the brake system of the tractor. 2. A tractor-trailer unit according to item 1 distinguished by the fact that the stop unit is made up of locking pins which fit into the holes of the bearing plate and hydraulic clamps. 3. A tractor-trailer unit according to item 1 is distinguished by the fact that in order to provide safe, automatic control of its dumping, the supporting hydraulic jacks and the hydraulic clamps are connected in series to a single hydraulic system joined by means of a control valve to the hydraulic cylinder for raising the bed of the semi-trailer. The control valve makes contact with the bed.



USSR

UDC 621.59

A CRYOGENIC INSTALLATION

Moscow OTKRYTIYA, IZOBRETENIYA, PROMYSHLENNYYE OBRAZTSY, TOVARNYYE ZNAKI
in Russian No 17, 1978 p 119

[Description of Author's Certificate No 606043 Division F, filed 16 Feb
76, published 5 May 78]

AGAPOV, N. N., AGEYEV, A. I., BELUSHKIN, V. A. and ZEL'DOVICH, A. G.,
Joint Institute of Nuclear Research

[Text] This Author's Certificate introduces a cryogenic device, mainly
for helium, that contains a compressor, heat exchangers installed in
forward and return flow lines and an evaporator with built-in direct-flow
supercooler, followed in sequence by the object to be cooled and a choke.
As a distinguishing feature the temperature differential in the cooled
object is reduced by increasing the multiplicity of coolant circulation
through it. In the forward flow line in front of the supercooler an
ejector is installed with the receiving chamber connected to the line
that couples the object to be cooled with the choke.

CSO: 1861

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